RCS 05-817

EGLIN AIR FORCE BASE
Florida

FINAL
ENVIRONMENTAL ASSESSMENT

FOR IMMEDIATE STORM SURGE PROTECTION FOR SANTA ROSA ISLAND FACILITIES, EGLIN AIR FORCE BASE, FL

JUNE 2006

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FINAL FINDING OF NO SIGNIFICANT IMPACT
AND
FINAL FINDING OF NO PRACTICABLE ALTERNATIVE
FOR
IMMEDIATE STORM SURGE PROTECTION OF SANTA ROSA ISLAND FACILITIES, EGLIN AIR FORCE BASE, FLORIDA

RCS 05-817

Pursuant to the Council on Environmental Quality regulations for implementing procedural provisions of the National Environmental Policy Act (NEPA) (40 Code of Federal Regulations [CFR] 1500-1508), Department of Defense Directive 6050.1 and Air Force Regulation 32 CFR Part 989, the Air Force has conducted an Environmental Assessment (EA) of probable environmental consequences for implementing immediate storm surge protection to Santa Rosa Island (SRI) facilities at Eglin Air Force Base (AFB), Florida.

Purpose and Need

SRI is a narrow barrier island approximately 50 miles long and less than 0.5 mile wide. It is separated from mainland Florida to the northwest by Santa Rosa Sound, a shallow lagoon, and Choctawhatchee Bay. The Gulf of Mexico borders its southern shore. The Air Force controls approximately 4,400 acres of SRI: a 4-mile strip eastward of Fort Walton Beach and a restricted access 13-mile section extending west to Navarre Beach. Known as the SRI Range Complex, facilities and supporting infrastructure found here provide unobstructed, continuous land to sea access for unrestricted testing and training from sea level to high altitude. Utilized by the Air Force, Army, DoD, and Navy, this range allows testing and training of air-to-ground weapons, air-to-air weapons, command and control systems, and special operation weapons. When used in conjunction with Eglin Gulf Test and Training Range and other facilities on the Eglin Reservation mainland, SRI allows for unrestricted testing and training of present and future large footprint weapons (i.e., supersonic, hypersonic, directed energy, suborbital, etc.).

Because of continually decreasing land mass of the SRI Range Complex from successive hurricane and tropical storm events, test sites (TS) and supporting infrastructure are being damaged due to increased erosion and foundation undermine. In order to maintain the range's testing capabilities, it has become necessary to provide immediate storm protection for specific TS through repair and construction of seawalls and bulkheads. This would serve to channel storm surge energy away from each site and would allow the Air Force time to develop a long-term solution to protect this asset.

Description of Proposed Action and Alternatives

Proposed Action (EA Section 2.1, pages 2-1 to 2-8)

Under the proposed action the Air Force would repair and extend three damaged seawalls at TS A-3, A-11, and A-13; construct a new concrete pad, access road and bulkhead at TS A-3 ½, construct a new seawall at TS A-13B, and construct bulkheads at TS A-6, and A-18. The total length of new and repaired seawalls/bulkheads would be approximately 8,000 linear feet. Sand would be used to backfill behind the sheet pile and large rocks would be placed along the seaward side of the wall to dissipate energy from breaking waves.

No Action Alternative (EA Section 2.2, page 2-9)
There would be no changes made to the SRI Complex under the no action alternative. The Air Force would not repair or extend existing seawalls, or construct new seawalls, and bulkheads. Repairs to facilities and infrastructure would continue as normal until it becomes no longer feasible or cost-effective to do so. This would lead the Air Force to abandon some facilities.

Alternatives Eliminated from Further Analysis (EA Section 2.3, pages 2-9 to 2-10)
Each alternative at a minimum had to provide immediate stabilization of the shoreline to protect existing facilities currently exposed to the ocean and had to be executable prior to start of the 2006 hurricane season. Below is a list of alternatives considered by the Air Force but not carried forward for further analysis.

Land Mass Restoration. This alternative would consist of rebuilding dunes and the SRI shoreline facing the Gulf of Mexico using sand dredged from offshore. While this alternative does not meet the immediate need for protecting existing facilities, it is addressed in this EA as a reasonably foreseeable action.

Relocate Buildings Northward from Gulf of Mexico Shoreline. Under this alternative, new test facilities would be built further inland of their current location in order relocate them farther away from the shoreline and the effects of erosion. While this alternative does not meet the immediate need for protecting existing facilities, it is addressed in this EA as a reasonably foreseeable action.

Build New Facilities on Pilings. This alternative would be similar to the alternative above, except new facilities would be built on pilings in order to prevent exposure of the structures to wave action and storm surge during tropical weather events. While this alternative does not meet immediate need for protecting existing facilities, it is addressed in this EA as a reasonably foreseeable action.

Demolish Existing Structures and Use Temporary Buildings Whenever a Test is scheduled. This alternative is not feasible because the Air Force cannot house the equipment necessary for test support in a temporary structure; the structure must be a fixed unit that maintains current capabilities.

Summary of Anticipated Environmental Effects
An EA was conducted to determine potential impacts to human and natural environments resulting from the proposed action and the no-action alternative. A summary of the findings are discussed below with detailed discussion found in Chapter 4 (Environmental Consequences) of the EA. Cumulative impacts were analyzed in Chapter 5.

Air Quality (EA Section 4.1, pages 4-1 to 4-2)
The proposed action would not negatively impact air quality. Air emissions would be short term and would diminish once construction and demolition (C&D) activities are completed. There would be no impacts to air quality under the no action alternative.

Water Resources (EA Section 4.2, page 4-2)
The proposed action would not affect any surface waters (ponds or wetlands) on SRI. Because of storm-induced shoreline erosion, TS A-3, A-11, and A-13 are partially located in the Gulf of Mexico. The effects to turbidity levels caused by construction activities would be on a much smaller scale than normally caused by continuous wave action; therefore, there would be no significant effects on gulf water quality under the proposed action. There would be no impacts to water quality under the no action alternative.

Soils and Sediment (EA Section 4.3, page 4-3)
Seawall repair and construction can affect oncoming wave energy and longshore transport of sand. However, with the significant amount of natural erosion currently occurring, soil impacts associated with construction would result in minimal effects to sediment composition and transport.

There would be no impact to soil and sediment under the no action alternative. Natural erosion and loss of beach sand would continue to occur.

Floodplains (EA Section 4.4, pages 4-3 to 4-4)
Nearly all of SRI Range Complex is within a special flood hazard area and designated by Federal Emergency Management Agency as a V-zone hazard for storm surge. Because construction would not alter the SRI base elevation and the facilities on the island are non-habitable structures, the proposed action would not have significant adverse effects to the floodplain or to structures within the floodplain. Under the no action alternative, there would be no impact to the floodplain.

Public Access (EA Section 4.5, pages 4-4 to 4-5)
The proposed action and no action alternative would have no effect on public access because the affected areas are closed to the public.

Socioeconomics (EA Section 4.6, pages 4-4 to 4-5)
There would be no significant impacts to tourism, recreational and commercial fisheries, or commercial shipping with implementation of the proposed action or no action alternative. However, the no action alternative would result in economic losses for the Air Force of several million dollars if unprotected facilities experience destructive storm surge.

Hazardous Materials and Solid Waste (EA Section 4.7, pages 4-5 to 4-7)
The proposed action would not have significant impacts with regards to hazardous materials usage or spills. All handling of fuels for construction equipment would be in accordance with applicable federal, state, and Air Force regulations. With these management requirements in place, the Air Force does not anticipate significant impacts from hazardous materials or waste associated with the proposed action. There would be no impacts to this resource under the no action alternative.

Implementation of the proposed action will generate solid waste during C&D activities. However, this 2.6-3.4 percent increase would be minimal. By recycling certain wastes and equally distributing debris to various county landfills, this impact would be reduced further. There would be no impacts to this resource under the no action alternative.

Cultural Resources (EA Section 4.8, pages 4-7 to 4-8)
There is a potential impact to cultural resources from C&D activities associated with the proposed action. To protect these sites from ground disturbing activities such as digging, construction, vehicular traffic, etc., the Air Force will clearly mark and/or identify those areas eligible or potentially eligible for listing on the National Register of Historic Places. These designations may consist of fencing, field markers, and/or map location identifying areas to avoid. At TS A-3, A-11, and A-13 where historic structures have been identified, there would be a benefit impact with implementation of the proposed action because it would prevent further erosion damage at these facilities from storm surge.

The majority of the cultural resources sites would not be impacted by the no action alternative. However, continued erosion damage at TS A-3, A-11, and A-13 would negatively impact historic structures located there.

Noise (EA Section 4.9, pages 4-8 to 4-10)
The proposed action and no action alternative would not significantly impact noise levels. While C&D noise would temporarily disturb wildlife on the range, this impact would cease once C&D was completed.

Biological Resources (EA Section 4.10, pages 4-10 to 4-13, Appendix G-2, pages G-15 to G-62)
Effects from seawall and bulkhead construction to near shore and surf zone species would be minimal. There would be some loss of infaunal and larger invertebrate species (coquina, ghost crabs) as a result of placement of the structures; however this effect would be confined to a small area. There would be no impacts to this resource under the no action alternative.

Several federal listed endangered species inhabit the island. In a letter dated 15 June 2006, U.S. Fish and Wildlife Service (USFWS) concurred with the Air Force that the proposed action would not adversely impact the West Indian manatee, piping plover, or Florida perforate lichen; nor would it adversely modify designated critical habitat for the piping plover. The primary area of concern is potential impacts to several species of sea turtles. Because this action would directly and indirectly affect 26 acres spread over 1.1 miles of SRI Gulf of Mexico beachfront, USFWS stated the proposed action could incidentally take up to 1.51 loggerhead sea turtle nests, one adult loggerhead female sea turtle, and 172 loggerhead hatchlings annually, and 0.95 green sea turtle nest, one green adult female sea turtle, and 129 green turtle hatchlings biennially. The USFWS does not anticipate any take of leatherback or Kemp's ridley sea turtle nests, adult female turtles or hatchlings. To reduce potential sea turtle impacts, USFWS provided in accordance with Section 7 of the Endangered Species Act a Biological Opinion (BO) attached as a part of this document. Following the steps outlined within the opinion will reduce remaining adverse effects to insignificance.

The Air Force is responsible for overseeing and ensuring the contractor adheres to the construction requirements stipulation in the BO on structure placement and material used. Upon completion of construction, all material and debris must be removed and the affected beach shall be contoured similar to adjacent beaches outside of the work area. Storm protection work shall be conducted during daytime hours of the 2006 and 2007 sea turtle nesting season (1 May-31 October) once a daily sea turtle nest survey, nest marking and/or relocation are completed.

Nesting survey and egg relocation shall only be conducted by Eglin AFB in accordance with Eglin's Fish Wildlife Conservation permit and guidelines and conspicuously marked for military personnel or their contractors. All equipment or vehicles shall be removed from the beachfront nightly during the sea turtle nesting season. Stockpiled material or debris that cannot be feasibly removed shall have a barrier erected around them to prevent movement of adults or hatchlings underneath or into material or debris and becoming entrapped or disoriented. If the proposed action would cause erosion to adjacent sea turtle nesting habitat, appropriate remedial measures shall be undertaken, which include but may not be limited to removal or relocation of the seawall or bulkhead.

If a sea turtle adult, hatchling, or egg is harmed or destroyed, within 24 hours Eglin AFB shall immediately notify this location to USFWS and Wildlife Conservation Commission Sea Turtle Stranding and Salvage Network. Care should be taken in handling injured turtles or eggs to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials in the best possible state for later analysis. Within 60 days of the end of 2006 calendar year or completion of the project, a report describing the actions taken to implement the terms and conditions of the incidental take statement must be submitted to USFWS. This report shall include dates of the activities, assessment and action taken to address impacts to sea turtle and their habitats on SRI, if they occurred, and hatching and emerging success of nests. If no activities take place, a negative report is still required, with sea turtle nesting survey data for the year. Only if all the activities are cancelled will the above conditions not be required.

Cumulative, Irreversible, and Irretrievable Impacts (EA Section 5.1, pages 5-1 to 5-36)

No significant cumulative, irreversible, and irretrievable impacts to air quality, soil and sediment, public access, socioeconomics, hazardous material and solid waste, and noise would result with implementation of the proposed action. There would be beneficial impacts to wetland and floodplain areas since base elevation would be raised and natural barriers such as sand dunes would be restored. Potential impacts exist with water, cultural, and biological resources with implementation of land mass restoration and relocation of test facilities. Additional EAs will be completed on any future SRI project and will be forwarded to Headquarters Air Force Materiel Command for coordination and subsequent signature as funding becomes available.

Public Notice

The Air Force published a public notice in the *Northwest Florida Daily News* on 1 March 2006 inviting the public to review and comment on the EA (EA, Appendix H). The public comment period closed on 30 March 2006 with no comments received.

The Florida State Clearinghouse conducted a review of the draft EA for "Immediate Storm Surge Protection of Santa Rosa Island, Eglin AFB FL." Clearinghouse review is included in the EA (EA Appendix G-1, pages G-5 to G13). The Florida Department of Environmental Protection identified the requirement for the Air Force to obtain a Joint Coastal Permit for work seaward of the mean high water line.

Finding of No Practicable Alternative

Taking the above information into consideration, pursuant to Executive Order 11988, *Floodplain Management* and the authority delegated by Secretary of the Air Force Order 791.1, I find there is no practicable alternative to conducting the proposed action within the floodplain and the proposed action includes all practicable measures to minimize harm to the environment. This finding fulfills both the requirements of the referenced Executive Order 32 CFR 989.14 requirements for a Finding of No Practicable Alternative.

Finding of No Significant Impact

Based on my review of the facts and the environmental analysis contained in the attached EA and as summarized above, I find the proposed decision of the Air Force to provide immediate storm surge protection to mission critical facilities on the SRI Range Complex will not have a significant impact on the human or natural environment, therefore, an environmental impact statement is not required. This analysis fulfills the requirements of the NEPA, the President's Council on Environmental Quality and 32 CFR Part 989.

TIMOTHY K. BRIDGES, SES
Director of Installations
and Mission Support

22 Aug 06
DATE

Attachment:
Biological Opinion, 15 Jun 06

FINAL
ENVIRONMENTAL ASSESSMENT

FOR IMMEDIATE STORM SURGE PROTECTION FOR SANTA ROSA ISLAND FACILITIES, EGLIN AIR FORCE BASE, FL

Submitted to:

96th Civil Engineer Group
Environmental Management Division
96 CEG/CEV
Eglin AFB, FL 32542

JUNE 2006

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LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS

°C	Degrees Celsius
µg/m^3	Micrograms per Cubic Meter
96 CEG/CEVCP	96th Civil Engineer Group, Compliance
96 CEG/CEVH	96th Engineer Group, Cultural Resources Branch
96 CEG/CEVR	96th Civil Engineer Group, Environmental Restoration Branch
96 CEG/CEVSN	96th Civil Engineer Group, Natural Resources Section
96 CEG/CEVSNW	96th Civil Engineer Group, Wildlife
AAC	Air Armament Center
AAV	Amphibious Assault Vehicle
ACAM	Air Conformity Applicability Model
AFB	Air Force Base
AFI	Air Force Instruction
AFPD	Air Force Policy Directive
AOC	Area of Concern
ARG/MEU	Amphibious Ready Group/Marine Expeditionary Unit
ASMFC	Atlantic States Marine Fisheries Commission
AST	Aboveground Storage Tank
AWWA	American Water Works Association
BO	Biological Opinion
BRAC	Base Realignment and Closure
C&D	Construction and Demolition
CAA	Clean Air Act
CCCL	Coastal Construction Control Line
CFR	Code of Federal Regulations
cm	Centimeter
cm^2	Square Centimeter
CO	Carbon Monoxide
CT	Conservation Target
CZMA	Coastal Zone Management Act
dB	Decibel
dBA	A-Weighted Decibels
DoD	Department of Defense
DoI	Department of Interior
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
ERP	Environmental Restoration Program
ESA	Endangered Species Act
FAC	Florida Administrative Code
FC	Federal Candidate
FDEP	Florida Department of Environmental Protection
FE	Federally Endangered
FEMA	Federal Emergency Management Agency
FMRI	Florida Marine Research Institute
FNAI	Florida Natural Area Inventories
FONSI	Finding of no Significant Impact
FT	Federally Threatened
FWC	Florida Fish and Wildlife Conservation Commission
FY	Fiscal Year
g/cm^3	Grams per Cubic Centimeter
g/hp-hr	Grams per Horsepower per Hour

LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS, CONT'D

g/hr	Grams per Hour
GIS	Geographic Information System
GIWW	Gulf Intracoastal Waterway
GSMFS	Gulf States Marine Fisheries Commission
HAPs	Hazardous Air Pollutants
hp	Horsepower
Hz	Hertz
INBS	Index Nesting Beach Survey
IWR	Impaired Waters Rule
JCP	Joint Coastal Permit
kHz	Kilohertz
km^2	Square Kilometers
lbs	Pounds
lbs/ft^3	Pounds per Cubic Feet
m	Meters
MAFLA	Mississippi, Alabama, Florida
mg/m^3	Milligram per Cubic Meter
MHWL	Mean High Water Line
mm	Millimeters
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NAAQS	National Ambient Air Quality Standards
NEI	National Emissions Inventory
NEPA	National Environmental Protection Agency
NFA	No Further Action
NHPA	National Historic Preservation Act
nm	Nautical Miles
NMFS	National Marine Fisheries Service
NO_2	Nitrogen Dioxide
NOAA	National Oceanic and Atmospheric Administration
NO_x	Nitrogen Oxides
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRS	Natural Resources Section
NTU	Nephelometric Turbidity Unit
O_3	Ozone
OA-HITL	Open Air Hardware-in-the-Loop
OCS	Outer Continental Shelf
OSHA	Occupational Safety and Health Administration
Pb	Lead
PCB	Polychlorinated Biphenyl
PM_{10}	Particulate Matter With a Diameter Less Than or Equal to 10 Microns
$PM_{2.5}$	Particulate Matter With a Diameter Less Than or Equal to 2.5 Microns
POI	Point of Interest
POL	Petroleum, Oil, and Lubricant
ppm	Parts per Million
PSD	Prevention of Significant Deterioration
RCRA	Resource Conservation and Recovery Act
RF	Radio Frequency
ROI	Region of Influence
SE	State Endangered

LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS, CONT'D

SER	Significant Emissions Rate
SFHA	Special Flood Hazard Areas
SHPO	State Historic Preservation Office
SHWT	Seasonal High Water Table
SI	Site Investigation
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SRI	Santa Rosa Island
SSC	Species of Special Concern
ST	State Threatened
TS	Test Site
U.S.	United States
U.S.C.	United States Code
USACE	United States Army Corps of Engineers
USAF	U.S. Air Force
USDOC	U.S. Department of Commerce
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UST	Under Ground Storage Tank
VOC	Volatile Organic Compounds

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1. PURPOSE AND NEED FOR ACTION

1.1 PROPOSED ACTION

The U.S. Air Force (USAF) proposes to initiate immediate and temporary severe storm event (i.e., tropical storms, hurricanes, etc.) protection to mission-critical test facilities at Santa Rosa Island (SRI) Range Complex at Eglin Air Force Base (AFB), FL (Figure 1-1). The Proposed Action would involve: 1) existing seawall repair, replacement, and extension and 2) construction of new seawalls and bulkheads. The Air Force would implement the Proposed Action prior to the 2006 hurricane season.

Under the Proposed Action, the Air Force would accomplish the following construction actions at these mission-critical Test Sites (TS):

- Replace the seawall at TS A-3.
- Construct a new concrete pad and bulkhead at TS A-3½.
- Construct a new bulkhead at TS A-6.
- Repair and extend the seawall at TS A-11.
- Repair and extend the seawall at TS A-13.
- Construct a new seawall at TS A-13B.
- Construct a bulkhead at TS A-18.

A reasonably foreseeable future action is to protect facilities through land mass restoration, discussed in Chapter 5, Cumulative Impacts. Land mass restoration would consist of shoreline restoration of 17 miles of Air Force-owned beach along the Gulf-side of the SRI Range Complex and dune restoration. The U.S. Army Corps of Engineers (USACE) would construct dunes of various lengths throughout several locations on SRI. The USACE would dredge and pump sand from Gulf-side offshore areas onto the island for land mass restoration.

1.2 BACKGROUND

The Region of Influence (ROI) for the Proposed Action consists of SRI and its surrounding area (Figure 1-1). SRI is a narrow barrier island approximately 50 miles long and less than 0.5 mile wide, separated from mainland northwest Florida by Santa Rosa Sound, a shallow lagoon varying in width from 400 to nearly 5,000 feet, and Choctawhatchee Bay. The Gulf of Mexico borders the south shore of SRI and Santa Rosa Sound and Choctawhatchee Bay border the north shore. Eglin AFB controls approximately 4,400 acres of SRI: a 4-mile strip eastward of Fort Walton Beach and a restricted access 13-mile section extending west to Navarre Beach, Florida. There are 2.5 miles of Okaloosa County property between the two parcels of Eglin property. Eglin also controls a small test site (A-5) within this portion of the Island. Each of the three sections of Island has unique characteristics (developed versus undeveloped land) and 15 Eglin

Figure 1-1. Regional Setting of the Proposed Action

AFB test sites are located on SRI (USAF, 2005). Current land use within the SRI ROI consists of military mission activities, natural and cultural resource management, and public use. Public use occurs only on county-owned property, the limited-access portion of the Island east of Fort Walton Beach, and within the waters of the Gulf of Mexico, Santa Rosa Sound, and Choctawhatchee Bay.

SRI is a unique 46th Test Wing facilities and supporting infrastructure on the only Department of Defense (DoD) range that provides unobstructed continuous land to sea access for unrestricted testing and training from sea level to high altitude. The SRI Range Complex is a one-of-a-kind environment that cannot be replicated at any other existing DoD range or installation. The 46th Test Wing provides testing and training for air-to-ground weapons, air-to-air weapons, command and control systems, and special operations weapons testing for Air Force, Navy, Army and DoD. The SRI Range Complex supports amphibious exercises, joint single and multi-service training, and Patriot and vehicle-mounted missile launches. The Open Air Hardware-in-the-Loop (OA-HITL) 300-foot tower at TS A-13B and its three associated focus sites, TS A-3, A-6 and A-17A provide unique aircraft and weapons simulation testing capabilities. All the test sites on the SRI Range Complex are vital to the overall test and training mission of the 46th Test Wing. When used in conjunction with the Eglin Gulf Test and Training Range and other facilities on the Eglin Reservation mainland, SRI allows for the unrestricted testing and training of present and future large footprint weapons (supersonic, hypersonic, directed energy, suborbital, etc.). In conjunction with other Eglin sites, SRI facilities work as part of an integrated radio-frequency (RF) source identification system to identify RF sources interfering with test missions across the Eglin range. Identification of outside RF sources is critical during munitions testing for safety reasons. If unable to monitor munitions flight termination emissions, the unrestricted testing and training with large footprint weapons cannot occur. Realistic and unrestricted test and training is critical to national security objectives.

Several SRI Range Complex Test Sites provide particularly unique capabilities found on no other DoD ranges:

- Site A-3 is a critical facility with unobstructed line of sight for key radar/optical tracking and flight termination instrumentation from sea level to high altitude.
- Site A-11 provides the only unobstructed DoD line of sight from sea level to high altitude for threat early warning and air defense systems for the specific unique threat system integrated into that facility.
- Site A-13B provides the only DoD structure capable of sea-level testing of surface and airborne seekers and sensors used in missile guidance/detection systems in a humid, sub-tropical environment.
- Site A-15 provides the only live fire of ground launched missiles into the adjacent Joint Gulf Range.

The SRI Range Complex supported 24 quick reaction tests for munitions in support of Operations Iraqi Freedom and Enduring Freedom. In addition, the SRI Range Complex tested the air defense system implemented in the National Capitol Region after 9/11; and was

specifically chosen for its unique ability to provide unobstructed tests from sea level to high altitude.

The following military mission activities occur across the length of Eglin-owned property:

Testing

The purpose of test missions is to verify, validate, or demonstrate operational capabilities of new or upgraded hardware, software, aircraft, or weapons systems, or the effectiveness of tactics. The major testing categories are Air Operations Testing, Electronic Countermeasures and Electronic Systems Testing, Surface-to-Air Missile Testing, Open Air Hardware in the Loop Testing, Surf Zone Testing/Training, Landing Craft Air Cushion Training and Weapons Testing, and Ground Testing.

Training

The Air Force designs training missions or activities to teach, maintain, or increase operational proficiency. Training is divided into categories, and in some cases levels within these categories. The major training categories occurring within the SRI ROI are Personnel/Equipment Drops and Extractions and Ground Training Operations.

1.3 NEED FOR THE PROPOSED ACTION

Eglin AFB needs to maintain their current national security and testing support infrastructure with uninterrupted and unencumbered capabilities and mission support for the Air Force and DoD. Continually decreasing land mass on the SRI Range Complex from successive storm events has subjected test sites and supporting infrastructure (roads, utilities, etc.) to ever increasing damage. This threatens to interrupt or decrease current mission support capabilities that are critical to our national defense testing competencies. Many test sites have experienced severe erosion and varying degrees of facilities foundation undermining and damage as a result of Hurricane Ivan (Sep 04), Tropical Storm Arlene (Jun 05), Hurricane Dennis (Jul 05) and Hurricane Katrina (Aug 05). Test sites, which were located 100-plus yards from the mean high water mark in 1995, are now in many locations only yards away from the mean high water mark. The existing seawall at TS A-3 has failed and portions of the seawall no longer exist. TS A-11 was recently condemned after sand eroded from under its foundation after Hurricane Katrina's storm surge, even though Hurricane Katrina made landfall more than 300 miles to the West. TS A-13 experienced severe erosion and as a result, there is a 30-foot gap in the seawall. Storm surge erosion has exposed the rear of the wall and support braces have failed or are no longer present. Erosion has progressed to the facility foundation at TS A-13 and the facility is in danger of complete destruction from future storm events. The utility waterline between TS A-15 (Bio Lab, Marine Operations, Urban Assault Training, Admin, and Fire Department) and TS A-17 (Western Focus Site) was damaged and testing at these sites has been postponed until completion of repairs due to lack of firefighting capability. Hurricane Dennis partially or completely damaged 9.8 out of 14 miles of road on the SRI Range Complex.

Protection from wave action and storm surge is crucial to maintaining national security and testing capabilities. Without it, partial or complete destruction of testing sites and/or supporting infrastructure would likely occur during future severe weather events. Figures 1-2 through 1-8 illustrate the damage at some of the test sites.

Figure 1-2. Test Site A-3 Seawall and Lack of Beach Area

Figure 1-3. Exposed Foundation at Test Site A-6

Figure 1-4. Proximity of Test Site A-11 to Waters Edge Illustrating Need for Seawall Extension/Repair

Figure 1-5. Test Site A-11 Seawall in Need of Repair

Figure 1-6. Seawall in Need of Repair at Test Site A-13

Figure 1-7. Damaged Facilities at Test Site A-13

Figure 1-8. South Leg of 300-foot Tower at Test Site A-13B in Proximity to Waters Edge (Illustrates Need for Seawall and Shoreline Restoration)

1.3.1 Objective of the Proposed Action

The objective of the Proposed Action is to maintain the test infrastructure on SRI with uninterrupted access to the unique capabilities it possesses. In order to maintain these capabilities, it is necessary to provide immediate storm protection for specific test sites on SRI through the repair and construction of seawalls and bulkheads. Repair and construction of seawalls and bulkheads would serve to channel storm surge energy away from facilities at respective sites. The Proposed Action would allow the Air Force to provide immediate but temporary protection to critical SRI facilities until a long-term solution can be developed.

1.4 RELATED ENVIRONMENTAL DOCUMENTATION

The following environmental and planning documents are related to actions and resources associated with the SRI ROI:

- Formal Endangered Species Act Section 7 Consultation (Biological Assessment) for Hurricane Ivan Repairs at Eglin AFB, FL – USAF, June 2005.
- Eglin AFB Beach Management Plan – USAF, March 2005.
- Santa Rosa Island Mission Utilization Plan Final Programmatic Environmental Assessment – USAF, January 2005.
- Santa Rosa Island Mission Utilization Plan Programmatic Biological Assessment – USAF, January 2005.

- Final Environmental Assessment Santa Rosa Island Reconstitution Test Capabilities – USAF, April 1998.
- Amphibious Ready Group / Marine Expeditionary Unit (ARG/MEU) Environmental Assessment – USAF, April 2003.
- Amphibious Ready Group / Marine Expeditionary Unit (ARG/MEU) Biological Assessment – USAF, April 2003.

1.5 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

This environmental assessment (EA) identifies, describes, and evaluates the potential environmental impacts that may result from seawall repair/construction under the Proposed Action, as well as from the No Action alternative. As appropriate, the EA describes the affected environment and environmental consequences of the Proposed Action in terms of site-specific descriptions or regional overview. In addition, this EA identifies measures to prevent or minimize environmental impacts.

Based on an analysis of impacts, the Air Force would make a determination on the significance of impacts in a decision document. If anticipated impacts are significant, the Air Force either would prepare an environmental impact statement (EIS) or would not implement the Proposed Action. If the Air Force determines that the impacts are not significant, the Air Force would prepare a finding of no significant impact (FONSI).

1.5.1 Environmental Issues Eliminated Through Preliminary Impact Analyses of the Proposed Action and Alternatives

The Air Force conducted preliminary impact analyses to identify resource areas that the Proposed Action and No Action alternative would potentially impact. Based on preliminary impact analyses, the Air Force does not anticipate the Proposed Action or No Action alternative to result in impacts to the following resource areas: utilities, wetlands, safety, special risks to children, transportation, aesthetics, and environmental justice.

1.5.2 Issues Associated with the Proposed Action

After preliminary analyses of potential environmental impacts from the Proposed Action and the No Action alternative, the Air Force identified the potential for impacts to the following natural or human-related resources: public access, air quality, noise, water resources (fresh and marine), hazardous materials and solid waste, threatened and endangered species, floodplains, soils and sediments, socioeconomics, and cultural resources.

1.6 APPLICABLE REGULATORY REQUIREMENTS AND COORDINATION

The following regulatory requirements and coordination are associated with the Proposed Action:

- The Air Force would be required to file a Joint Coastal Permit (JCP) with the Florida Department of Environmental Protection (FDEP) Bureau of Beaches and Coastal Systems for construction and repair activities seaward of the Mean High Water Line (MHWL).
- The Air Force would be required to file an Individual Permit with the USACE. This federal permit typically follows successful application of JCP.
- The Air Force submitted a Coastal Zone Management Act Consistency Determination to the FDEP (Appendix F). State response is provided in Appendix G, Attachment G-1.
- The Air Force conducted an Endangered Species Act (ESA) Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS) for potential impacts to terrestrial and marine threatened and endangered species and critical habitat. The Air Force will comply with the Terms and Conditions of the USFWS Biological Opinion attached to this EA as Appendix G, Attachment G-2.
- The Air Force would be required to conduct a National Historic Preservation Act (NHPA) Section 106 consultation with the Florida State Historic Preservation Office (SHPO) to identify the potential impacts to known or suspected areas of cultural resources.

1.7 DOCUMENT ORGANIZATION

This EA contains seven chapters. Chapter 1 contains a statement of the purpose and need for the action and the location of the Proposed Action. It also describes the decision to be made and summarizes the scope of the environmental review.

Chapter 2 contains a brief introduction, describes the history of the formulation of alternatives, describes the alternatives eliminated from further consideration, provides a detailed description of the Proposed Action, lists the No Action alternative, summarizes other actions anticipated in the ROI, and provides a comparison matrix of environmental effects for all alternatives. This section also identifies the preferred alternative and discusses regulatory requirements and/or best management practices, as required.

Chapter 3 describes, in general, the current conditions of the resources that the Proposed Action could affect. Chapter 4 provides an analysis of the environmental consequences of the Proposed Action and the No Action alternative. Chapter 5 provides an analysis of cumulative impacts and irretrievable commitment of resources. Chapter 6 identifies management practices for minimizing potential impacts. Chapter 7 lists persons and agencies consulted in the preparation of this EA. Chapter 8 lists publications cited in this report. The appendices contain additional materials that are relevant to the resource areas discussed in Chapters 3 and 4.

2. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

As required by federal regulation, this EA addresses the possible environmental impacts of the Proposed Action and a No Action alternative.

2.1 PROPOSED ACTION (PREFERRED ALTERNATIVE)

The Proposed Action is the Preferred Alternative of the Air Force. The Air Force proposes to repair and extend three damaged seawalls at TS A-3, A-11 and A-13, construct a new concrete pad and bulkhead at TS A-3½, construct a new seawall at TS A-13B, and construct bulkheads at TS A-6 and A-18. The Air Force would execute the Proposed Action as quickly as possible in order to repair existing damaged seawalls and protect facilities most at risk from storm surge. The Air Force would implement the Proposed Action prior to the 2006 hurricane season, which begins June 1. Figures 2-1 through 2-5 identify locations of existing and proposed seawalls within the entire project area.

2.1.1 Repair/Construct Seawalls and Bulkhead at Test Sites A-3, A-6, A-11, A-13, A-13B and A-18.

The total length of the new and repaired seawall or bulkhead would be approximately 8,000 linear feet. Upon completion each new or repaired and extended seawall would be 500 feet in length along the Gulf front with two adjoining walls, also 500 feet in length (Figure 2-6). The seawalls would consist of 40-foot steel sheet piles capped with a continuous 3 x 3 foot reinforced concrete beam, and encased with reinforced concrete varying in heights from 12 to 17 feet (Figure 2-7). The USACE would deposit approximately 3,500 cubic yards of sand as backfill behind the sheet pile, and would place large rocks on the seaward side of the wall to help dissipate energy from breaking waves. The USACE would demolish approximately 1,610 feet of existing damaged seawall at TS A-3 (Figure 1-2) and A-11 (Figure 1-5). The bulkhead proposed for TS A-6 would be approximately 6 feet high (Figure 2-8), 750 feet in length and encompass the south, east and west sides of the facility, including the access road (refer back to Figure 2-4). The bulkhead proposed for TS A-18 would be approximately 10 feet high and encompass the south, east and west sides of the facility pictured in Figure 2-9.

2.1.2 Construct New Concrete Pad and Bulkhead at Test Site A-3½

The Air Force would construct a 4,885 square foot concrete equipment pad at TS A-3½ (Figure 2-10). The concrete pad would support mobile radar equipment and heavy truck loads. The concrete pad would be 12 inches thick with 2 layers of 8-inch steel and an underlying base of 8 inches of crushed rock. The crushed rock would be Bahama rock or a suitable substitute. The Air Force proposes to construct an access road 180 feet long by 12 feet wide, composed of 6-inch thick crushed rock, and place approximately 10,000 cubic yards of white beach sand around the existing site. The Air Force would construct a concrete bulkhead extending vertically down from the perimeter of the concrete pad.

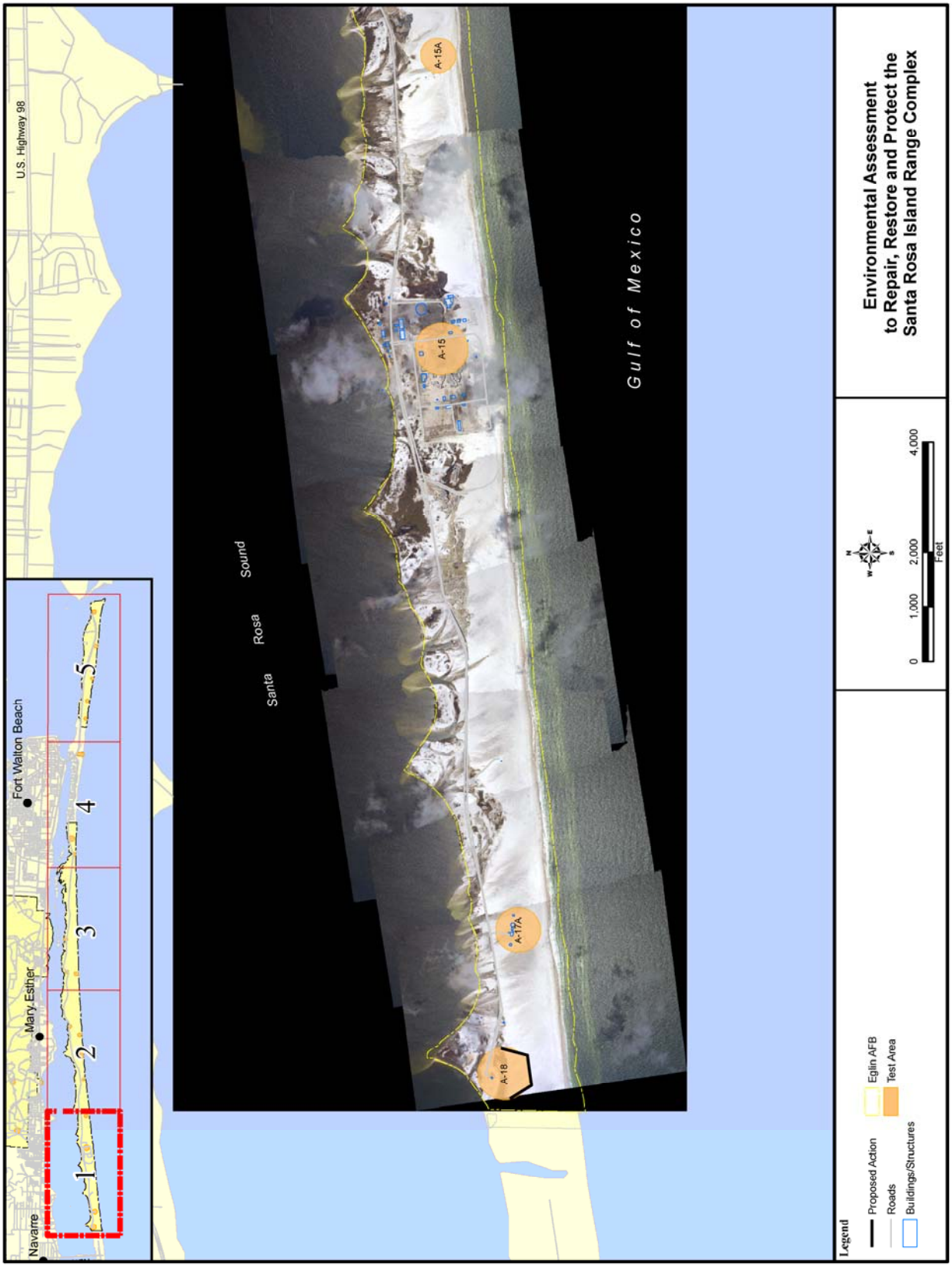

Figure 2-1. Aerial View of the Proposed Action (view 1)

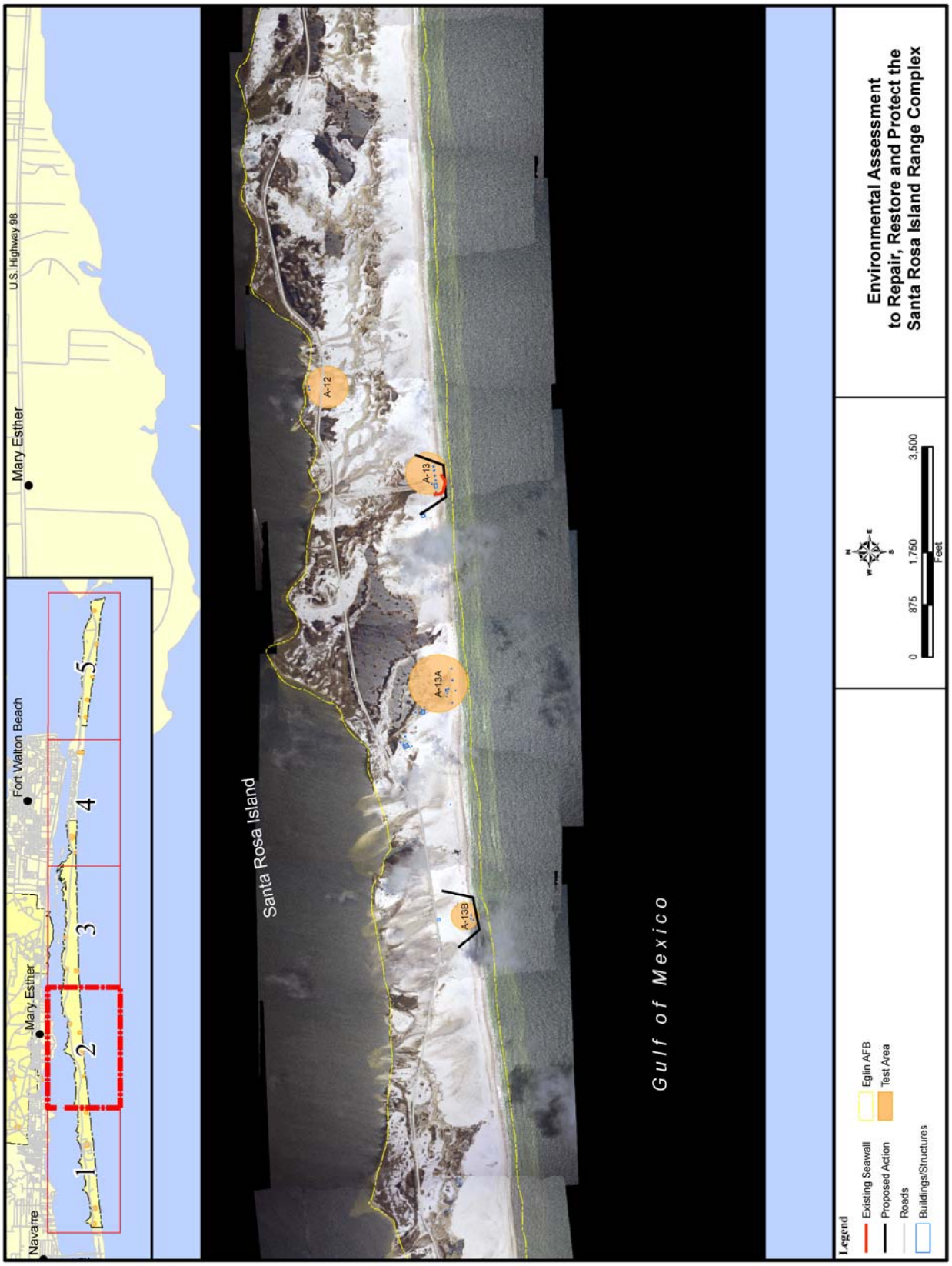

Figure 2-2. Aerial View of the Proposed Action (view 2)

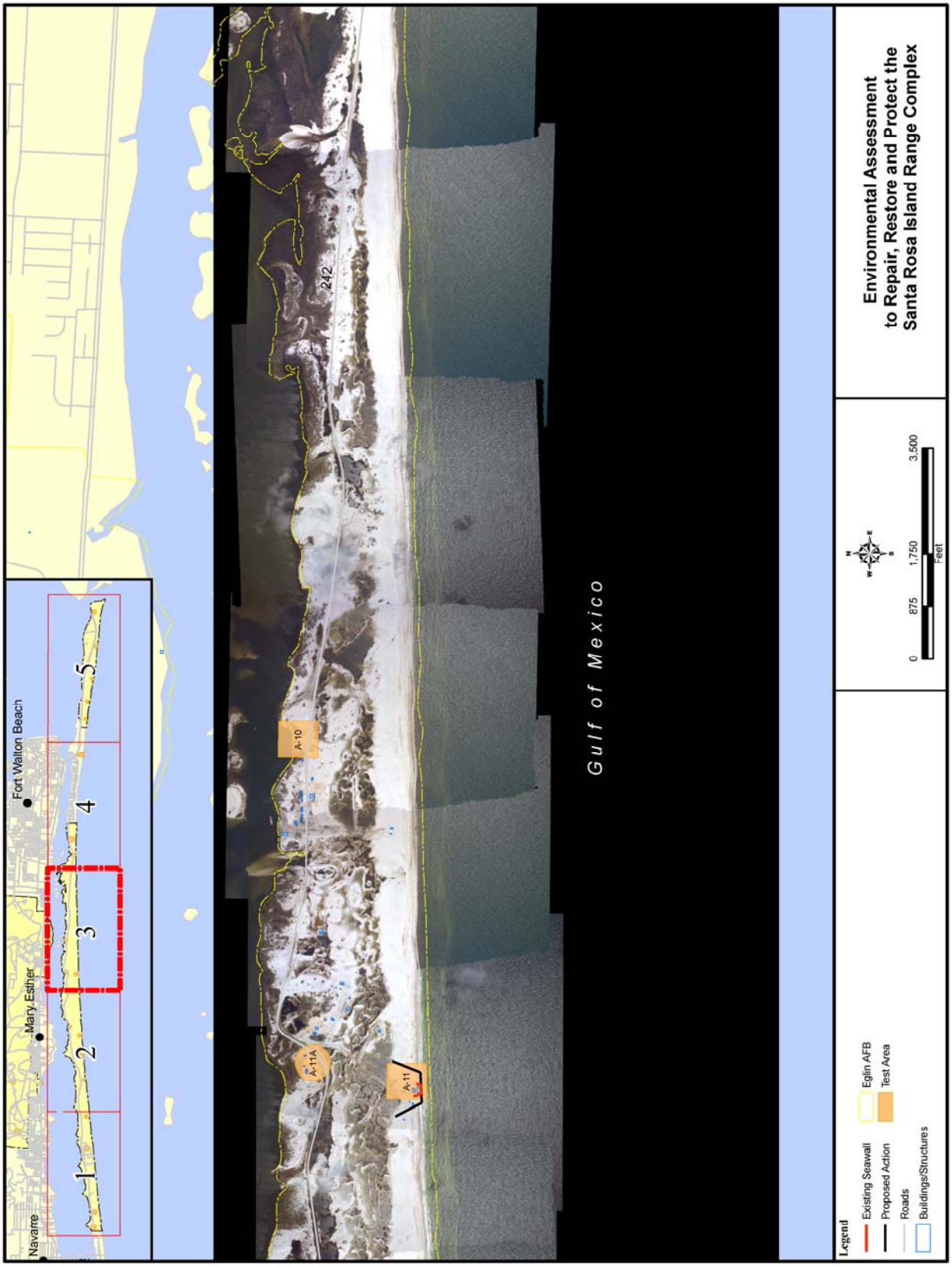

Figure 2-3. Aerial View of the Proposed Action (view 3)

Figure 2-4. Aerial View of the Proposed Action (view 4)

Figure 2-5. Aerial View of the Proposed Action (view 5)

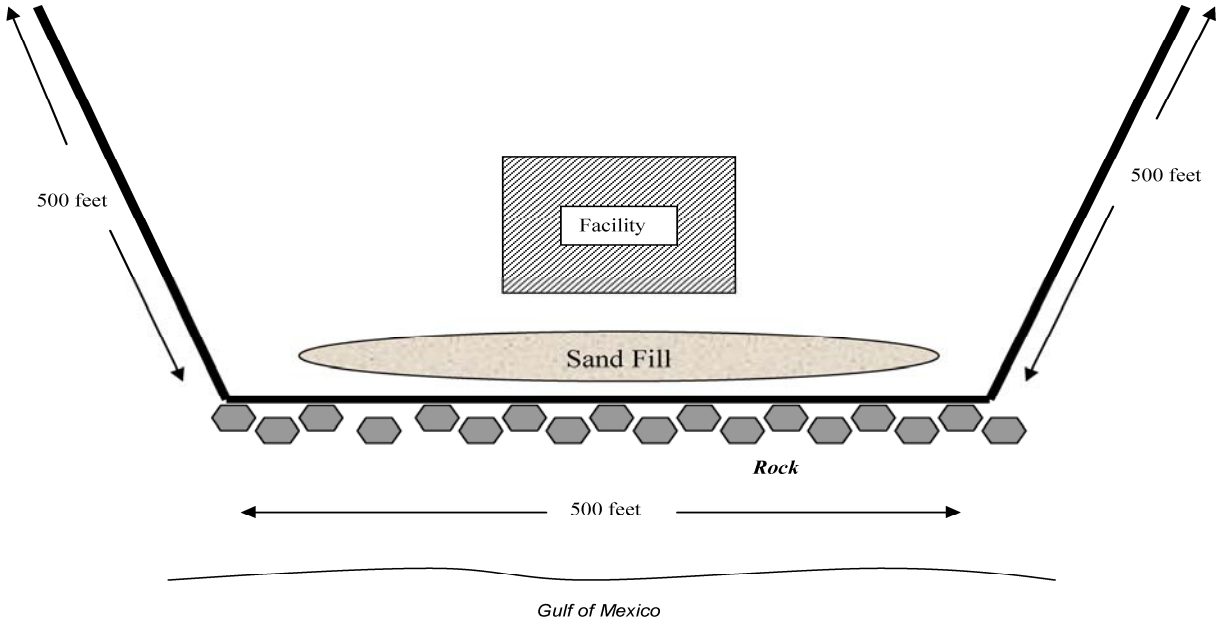

Figure 2-6. Concept for Proposed New and Repaired Seawalls

Figure 2-7. Existing Concrete-encased and Capped Sheet Pile Seawall at Test Site A-3

Figure 2-8. Proposed Bulkhead Location at Test Site A-6

Figure 2-9. Proposed Bulkhead Location at Test Site A-18

Figure 2-10. Proposed Concrete Pad and Bulkhead Location at Test Site A-3½

2.2 NO ACTION ALTERNATIVE

The No Action alternative would result in no changes to the SRI Complex. The Air Force would not repair or extend existing seawalls, or construct new seawalls and bulkheads. Repairs to facilities and infrastructure would continue as normal until it becomes no longer feasible or cost effective to do so. This would lead the Air Force to abandon some test sites.

2.3 ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD

Varieties of alternatives were considered that would meet the purpose and need of providing uninterrupted and continuous (short-term) access to the Eglin AFB possessed mission-critical national defense capabilities at the Test Sites on SRI. The current situation is precarious due to the highly eroded shoreline and vulnerability of many of the test sites to any weather event that would result in additional erosion. Therefore, any alternative considered possesses, at a minimum, the need to provide immediate stabilization of the shoreline to protect existing facilities that are already exposed to the ocean during tropical weather events. Further complicating this minimal need is the requirement that the Air Force begin implementing a solution prior to the start of next hurricane season (June 2006). Therefore, other alternatives considered were not viable because they all possessed two elements: 1) they would require sea wall construction or shoreline restoration regardless of follow-on actions in order to meet the need date of June 2006; and 2) relocation and new construction of replacement facilities would take several years to complete, thus requiring that the stabilization efforts would have a life expectancy of several years in order to maintain current testing capabilities during new construction efforts. The following section describes alternatives that the Air Force considered and explains the reasons the Air Force did not carry these alternatives forward for analysis.

2.3.1 Non-Viable Alternatives

Relocate Buildings Northward from Gulf of Mexico Shoreline

This alternative would consist of building new test facilities further north than the current facilities in order to move them farther away from the current shoreline and the effects of shoreline erosion. This would require that the current facilities be protected by seawall reinforcement and/or shoreline restoration and in order to maintain test support capabilities during the time that the new facilities were being constructed in the northward locations. It would also require demolition and disposal of the current facilities once the new facilities were completed. Because protection and stabilization of existing facilities is required with this alternative, it would have the same or greater environmental impacts as the Proposed Action, plus the environmental impacts of new construction and demolition (C&D), transportation, and disposal of the debris from the replaced facilities. Thus, it has greater environmental impact than the Proposed Action and does not meet the immediate need for protecting existing facilities.

Build New Facilities on Pilings

This alternative would be very similar to the previously described alternative except that rather than relocating the facilities farther from the shoreline, the new facilities would be built on pilings in order to prevent exposure of the buildings to wave action and storm surge during tropical weather events. Like the previous alternative, this would require that the current structures be protected via seawall repair and/or shoreline restoration and in order to maintain test capabilities while the new facilities were constructed on pilings. Also, demolition of the existing structures and transportation and disposal of demolition materials would be required. Because the Air Force would construct the new structures before demolition of the existing structures, the infrastructure footprint along the shoreline would increase during C&D activities. This would have potential environmental impacts to nesting sea turtles by limiting the available area for nesting and potentially obstructing both adults and hatchling mobility. This alternative would have greater environmental impact than the Proposed Action and would not provide expedited protection to the existing facilities. This alternative is similar to the preferred alternative identified in the *Final Environmental Assessment Santa Rosa Island Reconstitution of Test Capabilities* (USAF, 1998), which proposed that certain SRI test actions be consolidated into three focus sites (A-1, A11 and A-13/14) and the OA-HITL tower be constructed. The facilities at the three focus sites would be established away from the water and elevated on pilings.

Demolish Existing Structures and Use Temporary Buildings Whenever a Test is Scheduled

This alternative is not feasible because the Air Force cannot house the equipment necessary for test support in a temporary structure; the structure must be a fixed unit that maintains current capabilities.

2.4 COMPARISON OF ALTERNATIVES

Table 2-1 provides a comparison of the Proposed Action and the No Action alternative.

Table 2-1. Comparison of Potential Issues by Action Alternative

Potential Issue	Proposed Action	No Action
Air Quality	There would be minor increases in air emissions associated with use of construction equipment.	Under the No Action alterative the environment within and adjacent to the proposed locations would remain as baseline and there would be no impacts associated with these resource areas beyond the scope of normal conditions and influences at these locations.
Biological Resources	Seawall and bulkhead construction and repair would temporarily disturb protected species including piping plovers and sea turtles and alter 1500 feet of potential sea turtle nesting beach habitat. The Air Force would comply with USFWS Terms and Conditions as stated in the Biological Opinion (Appendix G, Attachment G-2)	
Water Resources	The Air Force would avoid SRI surface waters. Turbidity in marine waters would increase but would not exceed state standards	
Soil and Sediment Resources	Soil resources would not be significantly affected. Disturbance would be confined to the immediate area around seawall and bulkhead construction	
Floodplains	Floodplain impacts would be insignificant. Alterations to the floodplain would not affect habitable structures.	
Public Access	There would be no impacts to public access. Proposed construction and repair occurs on Air Force owned property, inaccessible to the public.	
Socioeconomics	There would be no impacts to tourism, recreation or commercial shipping.	The No Action would increase the risk for multi-million dollar losses to the Air Force as a result of storm damage to infrastructure and facilities
Hazardous Materials and Solid Waste	Hazardous solid waste impacts would not be significant. Debris from construction would not exceed landfill capacity. Hazardous material would not be used in the Proposed Action.	The No Action would not generate solid waste or use hazardous materials.
Noise	The Air Force anticipates minimal noise effects. Construction noise may affect persons working at SRI facilities.	There would be no noise impacts under the No Action Alternative.
Cultural Resources	The Proposed Action would not affect cultural resources. Construction would occur at existing facilities away from known cultural resources.	The No Action would not provide added protection to historic resources, which would remain at greater risk of damage from storm events.
Threatened and Endangered species	The Proposed Action would potentially affect nesting sea turtles. Consultation with the USFWS and implementation of permit conditions would be required.	The No Action may have detrimental long-term impacts to sea turtles. The loss of land mass along the shoreline has reduced the available turtle nesting area at SRI.

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3. AFFECTED ENVIRONMENT

3.1 AIR QUALITY

Identifying the affected area for an air quality assessment requires knowledge of air emission sources, pollutant types, emissions rates and release parameters, proximity to other emissions sources, and local as well as regional meteorological conditions.

3.1.1 Definition of the Resource

The type and amount of pollutants emitted into the atmosphere determines air quality, the size and topography of the air basin, and the prevailing meteorological conditions. The levels of pollutants are generally expressed on a concentration basis in units of part per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). The air quality analysis centers on Okaloosa County since the proposed activities would occur specifically in this county and therefore this county is defined as the ROI).

Pollutant concentrations are compared to the National Ambient Air Quality Standards (NAAQS) and state air quality standards to determine potential effects. These standards represent the maximum allowable atmospheric concentration that may occur and still protect public health and welfare with a reasonable margin of safety. The NAAQS identify maximum allowable concentrations for the following criteria pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter equal to or less than 10 microns in diameter (PM_{10}), and lead (Pb). In the case of SO_2, the state of Florida has established more stringent standards (FAC, 1996).

Based on measured ambient air pollutant concentrations, the U.S. Environmental Protection Agency (USEPA) designates whether areas of the U.S. are meeting the NAAQS or not. Those areas demonstrating compliance with the NAAQS are considered "attainment" areas, while those that are not are known as "non-attainment." Those areas that cannot be classified on the basis of available information for a particular pollutant are "unclassifiable" and are treated as attainment until proven otherwise.

3.1.2 Existing Conditions

Regional Air Quality

The FDEP operates air quality monitors in various counties throughout the state (FDEP, 2003). Although there are no ambient monitors in Okaloosa County, there are monitors in neighboring Santa Rosa and Bay Counties. USEPA has classified all counties within the state of Florida as "attainment" for criteria pollutants per FDEP.

In addition, the Clean Air Act (CAA) establishes a national goal of preventing degradation or impairment in attainment areas. As part of the Prevention of Significant Deterioration Program (PSD), areas were designated as Class I, II, or III. National parks and wilderness areas are designated by Congress as Class I areas, where any appreciable deterioration in air quality is

considered significant. Class II areas are those where moderate, well-controlled industrial growth could be permitted. Eglin AFB is in a Class II area. Class III areas allow for greater industrial development. Currently there are no designated Class III areas in the U.S.

Under the PSD program, before construction of a new major source of air emissions, the source's emissions are estimated to determine if significant emissions rate (SER) thresholds are exceeded. If a source is to be modified, then the Air Force evaluates and compares its emissions to the SER thresholds to determine if modifications are significant. The SER thresholds are used to ascertain whether pollution controls or air quality dispersion modeling are necessary for the construction project (USEPA, 1990). It should be noted that mobile sources as well as those associated with construction activities are excluded from the PSD applicability process.

Baseline Emissions

An air emissions inventory qualitatively and quantitatively describes the amount of emissions from a facility or within an area. Emissions inventories are designed to locate pollution sources, define the type and size of sources, characterize emissions from each source, and estimate total mass emissions generated over a period of time, normally a year. These annual rates are typically represented in tons per year. Inventory data establish relative contributions to air pollution concerns by classifying sources and determining the adequacy as well as necessity of air regulations. Accurate inventories are imperative for development of appropriate air quality regulatory policy. These inventories include stationary sources and encompass equipment/processes such as boilers, electric generators, surface coating and fuels handling operations. Mobile sources include motor vehicles, aerospace ground support equipment and aircraft operations.

For comparison purposes, the USEPA 1999 National Emissions Inventory (NEI) data for Okaloosa County is presented in Table 3-1 (the 2002 USEPA Inventory was not utilized since it is still in draft form). The county data includes emissions data from point sources (a name and location identified stationary source), area sources (a point source whose emissions are too small to track individually, such as a home or small office building; or a diffuse stationary source, such as wildfires or agricultural tilling), and mobile sources (any kind of vehicle or equipment with gasoline or diesel engine, airplane, or ship).

Table 3-1. Baseline Emissions Inventory for Okaloosa County (tons/year)

Source Type	NO_x	CO	PM_{10}	VOC	SO_2
Point source	1,458	50,296	5,502	8,718	16
Non-road	1,072	15,033	144	1,969	115
On-road	5,061	40,563	146	4,114	192
Area source	1,196	46,093	10,865	5,385	345
Totals	***8,787***	***151,985***	***16,657***	***20,186***	***668***

Source: USEPA 1999 NEI Data

CO = Carbon Monoxide; PM_{10} – All particles less than or equal to 10 micrometers in diameter; NO_x = Nitrogen Oxides; NR = Not reported; SO_2 = Sulfur Dioxide; VOC = volatile organic compound

3.2 WATER RESOURCES

This section describes the qualitative and quantitative characteristics of water resources located on SRI. These resources include surface and sub-surface waters. Information on water quality and a separate section on turbidity, a water quality parameter important to dredge actions, are provided.

3.2.1 Surface Water

Surface water is any water that lies above groundwater, such as ponds and streams. Ponds and wetlands occur where local shallow clay and silt layers restrict the downward movement of water to the regional water table (USAF, 2005a).

There are brackish ponds and many other small wetlands but no natural surface fresh water bodies on SRI. After heavy rainfall, the ponds may become fresh for brief periods. No well-developed drainages exist, but numerous coves and inlets may be found along the northern edge of SRI. Based on topography, surface water either drains into Choctawhatchee Bay or the Gulf of Mexico.

Water Quality

Section 303 of the Clean Water Act requires states to establish water quality standards for waterways, to identify those that fail to meet the standards, and to take action to clean up these waterways. Florida recently adopted the Impaired Waters Rule (IWR) (Chapter 62-303, FAC), with amendments, as the new methodology for assessing the state's waters for 303(d) listing. Waters that are determined to be impaired using the methodology in the IWR and adopted by Secretarial Order, are submitted to USEPA for approval as Florida's 303(d) list. FDEP submits updates to Florida's 303(d) List of Impaired Surface Waters to USEPA every 2 years. The *2004 Integrated Water Quality Assessment for Florida: 2004 305(b) Report and 303(d) List Update* (FDEP, 2004) satisfies the listing and reporting requirements of Sections 303(d) and 305(b) of the Clean Water Act.

FDEP is currently rotating through all of Florida's basins over a 5-year cycle to update the 1998 303(d) list using the new Impaired Waters Rule. Until FDEP completes its new IWR assessments and these new lists are adopted by Secretarial Order, the 1998 303(d) list remains unchanged for the basins not yet verified. The FDEP has divided river basins across the state into groups, which the FDEP is addressing according to a rotation schedule. Currently, the FDEP has only verified Groups 1 and 2. SRI watersheds fall within the Choctawhatchee-St. Andrews Bay Basin, which is Group 3. Group 3 is in the draft verified stage.

Although there are no streams on SRI, water from SRI does drain in to the Gulf of Mexico, Choctawhatchee Bay, and Santa Rosa Sound. All waters in the Gulf of Mexico, Choctawhatchee Bay, and Santa Rosa Sound are defined as Class III (recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife), and portions of the sound and bay are also classified as Class II (shellfish propagation or harvesting). None of the watersheds draining SRI are listed as impaired on the 1998 303(d) list.

Turbidity

Turbidity is defined as a decrease in water clarity due to fine silt and clay particles in suspension. The nephelometric turbidity unit (NTU) is the legal standard for measuring turbidity. The state of Florida's standard for coastal water turbidity is 29 NTUs (ASMFC, 2002). Turbidity varies with depth, distance from shore, and season throughout the Gulf. Waves, tides, internal waves, seiches re-suspending bottom sediments, and biological events such as phytoplankton blooms may cause fluctuations in turbidity. Turbidity decreases from nearshore to offshore, as the influence of waves and tides decreases. Bottom turbidities tend to be higher due to the proximity of currents to the sediments (USAF, 2003). The severity of resuspension is related to several factors: 1) wave energy (more turbid during storms); 2) amount of sand placed on the beach (more sand may increase turbidity); 3) the quality of the sand (higher content of silt/clay caused elevated levels); and 4) the mode of placement (i.e., hydraulic pipeline or barge pump-out) (ASMFC, 2002).

3.2.2 Subsurface Waters

This section provides a discussion of the SRI water table. The water table is generally defined as the upper surface of the saturated (wet) zone of subsurface soil. Fluctuations of the water table over time are highly dependent on the balance between rainfall and evapotranspiration. Water tables are extremely dynamic features and exhibit wide and diverse fluctuations. Seasonal fluctuations may exceed several feet depending on the type of soil. Generally, well-drained soils have shorter periods of high water table levels and longer periods of low water table levels than poorly drained soils. Potential wetland soils such as Dorovan, Duckston, and Rutlege (see Section 3.3, Soil and Sediment Resources) generally have a seasonal high water table (SHWT) above or less than one foot from the surface. It is estimated that the 3,548 acres of Newhan-Corolla Complex Soils (62 percent of the proposed project area) typically have a relatively shallow water table with a SHWT that averages less than 3 feet below the surface. SHWT depth estimates are based on the Natural Resources Conservation Service (NRCS) published soil survey data (Overing and Watts, 1989). The SHWT is the shallowest depth to free water that stands in an unlined borehole or where the soil moisture tension is zero for more than a few weeks. Generally, the water table tends to move in the direction of maximum slope. Typically, the height of the subsurface water table fluctuates with cycles in seasonal rainfall though daily Gulf tide cycles (Corbett et al., 2000).

Waves and Tides

Tides within the SRI region are diurnal (twice daily) and microtidal (of small range). The mean tide range at East Pass is 0.43 meters (m) with a spring tidal range of 0.51 m. According to the Wave Information Study of the Waterways Experiment Station, USACE, the mean significant wave height for offshore Okaloosa County is 3.3 feet and the mean wave period is 8.5 seconds. The most frequent wave direction is out of the east-southeast (USAF, 2005a). There are several widely varying estimates of longshore sediment transport for this area. Most estimates range from 52,000 to 254,000 cubic yards per year. All estimates indicate that the net transport is to

the west, which is supported by the physical pattern of erosion west of the inlet and accretion east of the inlet (USAF, 2005a).

3.3 SOIL AND SEDIMENT RESOURCES

Soil and sediment resources include the potentially affected terrestrial (land) soils and marine sediments within the project area. A description of terrestrial landforms, soil and sediment types and characteristics, transport mechanisms, and topography is provided.

3.3.1 Soils

Land forms

SRI has been described as a barrier island complex, having the typical landforms of beaches, coastal dunes, interior dunes, and low-lying soundside beaches and marshes (Chafin and Schotz, 1995). Gulf beaches vary in width, and are relatively flat with gentle slopes. Beach sands vary from unsorted, mixed grain sizes and shells at the surf zone to finely graded and well-sorted grains on dunes. The coarse deposits found on the Gulf side are well oxygenated due to tidal flushing and large interstitial (between sand grains) spaces (Wolfe and Reidenauer, 1988).

Coastal dunes roughly parallel the Gulf beach, elevated 3 to 5 feet above high tide. They exist in a high-energy environment of wind and wave activity, and because of this, are continually changing. Coastal dunes consist of primary dunes, closer to shore and subject to the greatest wind and wave forces, and behind these, more stable secondary dunes. Sands from primary dunes are periodically eroded and redeposited during times of high and low energy wave-action. The exposure to salt, waves and wind limit the vegetation found on primary dunes.

Inland of the coastal dunes are the older, more vegetated, and more stable interior dunes. Gradual trapping of wind blown sands by the vegetation sometimes allows these dunes to build up to several meters in height. The interior dunes are usually aligned north to south from the effects of dominant southeast summer winds.

Prominent features of the soil-landscape interface that strongly influence the geomorphology and botanical features of the Island's terrestrial environments are interior Island depressions. Depressions represent landscape sink areas that function as collection reservoirs for surface runoff and groundwater seepage. Water tends to remain within these features for extended periods of time. Two types of depressions that occur within the proposed project area include muck and sand depressions.

SRI's sandy landscapes are dynamic environments that are subject to drastic changes in physical condition, community structure, and ecosystem functioning. The destructive forces of wind and water associated with the tropical storms and hurricanes that frequent these coasts consistently destroy and rebuild the Island's morphology and ecosystems. In extreme cases, so much sand may be eroded from beaches that ancient tree stumps are exposed. As an example, severe overwashing of SRI during Hurricane Opal (1995) reduced sand dunes from an average of 5 m to

1.5 m in height. Greater than 95 percent of the eroded beach-dune overwash sediments were deposited on the island interior and along the bay shoreline; in some instances the bay shoreline was extended by greater than 100 m. Morphological changes to the barrier island were generally governed by an erosion-deposition process that moved sediments from one side of the island to the other. In addition, there has been a significant coarsening of the beach sand component.

Soil Classification

Soils are classified according to the U.S. Department of Agriculture's National Cooperative Soil Survey classification, which includes soil order, suborder, great group, subgroup, family and series. Soil orders are the most general classification, providing very broad soil information on a small spatial scale, whereas soil series provide detailed data on a large spatial scale including series descriptions, taxonomic class, typical soil horizons, range of characteristics, geographic setting, drainage, soil water, vegetation and other features. Soil series provide trends and range of conditions that are common to a soil. Although soil series descriptions provide a fine level of detail, a range of variability may occur for site-specific soils. In this section, soils data are presented at the soil series classification levels.

The soil series identified as occurring within the proposed SRI project area is shown in Figure 3-1, with soil classification and characteristics are described in Table 3-2. Soils data was acquired from the U.S. Department of Agriculture, NRCS soil surveys for Santa Rosa, Okaloosa, and Walton counties (Weeks, et al., 1980; Overing and Watts, 1989; and Overing et al., 1995); field investigation and sampling of the Island's soils were not conducted for this environmental assessment.

Gulf of Mexico sandy materials are the principal constituents of the Island soil environment. Sands have block-like, spherical, large, single grained particles with sizes ranging from 2 millimeters (mm) to 10 mm. Sandy soils have 70 percent or greater sand size particles; many of the sandy soils on the Island have average sand contents greater than 95 percent. The unique combination of almost pure sand texture, low water and nutrient holding capacity, very high soil infiltration and hydrologic conductivity, and high rainfall (approximately 62 inches per year) has created a distinctive landscape of excessively drained, potentially high soil constituent leachability, sterile to low fertility, poor soil structure, and low biodegradation potential. Because of the geologically young age of Island soils, there has been less time available for soil development as compared to mainland coastal dune systems.

Generally, the Island's sandy soils are loose and uncoated throughout their profile, particularly the Newhan-Corolla Complex soils. Coating of sand grains by materials such as organic matter or iron/aluminum oxides can form cemented sand layers or hardpans that tend to restrict soil permeability and root penetration. Based on U.S. Department of Agriculture, NRCS soil survey data for the proposed project area (Weeks, et al., 1980; Overing and Watts, 1989; and Overing et al., 1995), naturally occurring spodic horizons are not anticipated subsurface features of Island soils.

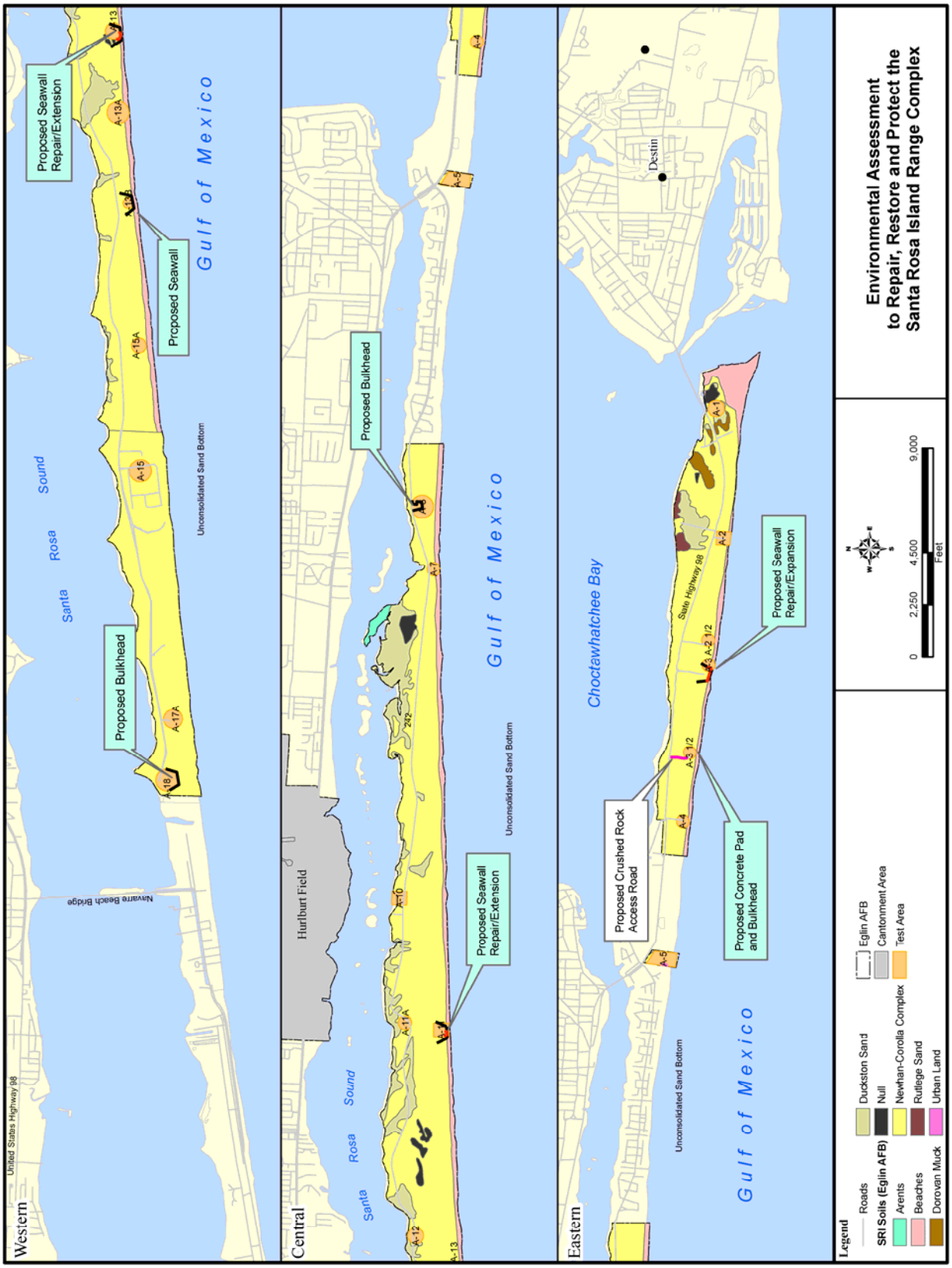

Figure 3-1. SRI Soils

Table 3-2. Santa Rosa Island Soil Characteristics[a]

Soil Series	Area (Acres)	Surface Material	Hydric Soil	Soil Depth (~Inches)	Slope Range (Percent)	Permeability (Inches Per Hour)	Seasonal High Water Table Type/Depth[b] (~Feet)
Arents	15	Sand	No	0 – 80	2 – 8	>20	NA/>6
Beaches	337	Coarse Sand	No	0 – 60	NA	>6	Apparent /0 – 6
Duckston	27	Fine Sand	Yes	0 – 80	<1	>20	Apparent/0 – 1
Dorovan	1,727	Mucky Peat	Yes	0 – 80	<2	0.6 – 2.0	Apparent/+2 – 0.5
Newhan-Corolla Complex	3,548	Fine Sand	No	0 – 80	0 – 10	>20	Apparent/1.5 – 3.0
Null	42	NA	No	NA	NA	NA	NA
Rutlege	13	Loamy Fine Sand	Yes	0 – 80	<1	6 – 20	Apparent/+2 – 0.5
Urbanland	1	NA	No	NA	0 – 5	NA	NA
Total	**5,710**						

[a] Soil data reflects conditions and features observed by the U.S. Department of Agriculture, Soil Conservation Service during field investigations in 1984.

[b] Measurement of high water table position in feet is relative to the land surface.

< = Less than; > = Greater than

NA – Data entries were not available or were not estimated.

Soil Moisture

Soil moisture is the portion of soil that supports vegetation. The moisture content of soil horizons varies with the seasons; a soil may be continuously moist in all or some horizons throughout the year or for part of the year. At SRI, soil moisture is a primary limiting factor that determines the form and function of ecosystems. Changes in soil moisture can alter the vegetation composition of ecosystems and subsequently the availability of wildlife habitats. Patterns of soil moisture within sand dunes can be irregular and vary dramatically, even in extremely dry conditions (Ritsema and Dekker, 1994). For the purpose of this EA, the soil moisture content in the proposed project area is based on the presence of hydric soil regimes.

A hydric soil is a soil formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. These soils are typically anaerobic (lacking oxygen) because of frequent durations of water saturation, inundation, or both for periods that exceed a few days. Based on fluctuations in surface (flooding and ponding) and subsurface (water table) hydrology, some hydric soils may have non-hydric phases. The presence of a soil on the hydric NRCS published list does not necessarily mean it is hydric. Water table fluctuations can have a significant effect on the hydrologic regime of ecosystems.

The three potentially hydric soils that occur within the proposed project area include Dorovan, Duckston, and Rutlege soil series (Table 3-2). Field surveys would be required to validate

hydric soil assumptions. More discussion on the water table is provided in Section 3.2, Water Resources.

3.3.2 Marine Sediments

Sediment Composition

The project area consists of natural beaches and sand dunes of predominantly white medium quartz sand with an average grain size of 0.25 to 0.50 mm. The relatively flat topography of the sediments that lie offshore is depicted by local bathymetric maps (Figure 3-2).

The beaches of Walton County, just to the east of Okaloosa County, are consistent with the beaches of Okaloosa County (Taylor Engineering, Inc., 2003). The shoreline restoration area encompasses three beach zones which define the natural communities within the beach and nearshore placement site. These zones, addressed in this evaluation, are classified as coastal beach and dune, intertidal swash, and the nearshore (URS 2004).

It is well recognized that sand comprises the bottom sediment across all of the shoreface and the continental shelf in the project area (URS 2004). Taylor Engineering, Inc. (2003) found that the sand in the beach system was fairly uniform throughout the study area. The beach system sediments consist of medium-grained sand with minor amounts of carbonate material. Generally, the native sand is described as white with slight variations in localized areas. The direction of the longshore transport is from east to west. The sandy substrate of the intertidal swash zone provides habitat for benthic and faunal communities characterized by low species diversity.

As with most sandy Panhandle beaches, the nearshore zone along Okaloosa County consists of two distinct longshore sandbars. For Florida panhandle beaches, the first and second sandbars are typically located approximately 50 to 80 feet and 425 to 460 feet offshore (Wolfe et al., 1988). These sandbars and associated troughs provide habitat for a diverse benthic (seafloor organisms) community. The amount of silt and calcium carbonate in sediments largely influence which types of species are found within a benthic community.

The composition of the sediments within the Gulf varies from the regions of the shelf to the slope to the deep seafloor. The Gulf of Mexico is a marginal ocean basin with a normal oceanic crust that is covered with sediments approximately 10 kilometers thick; the average accumulation rate of sediment is 10 centimeters (cm)/1000 years (MMS 1990).

Analyses of sediments collected during the Southwestern Florida Shelf Study (Woodward-Clyde Consultants, 1983) revealed that the sediments from soft bottom stations are comprised of insoluble quartz clastics (sediments formed from eroded rock), fine-grained carbonate mud, and carbonate sand. The predominate sediment type covering the majority of the stations is carbonate sand (Woodward-Clyde Consultants, 1983).

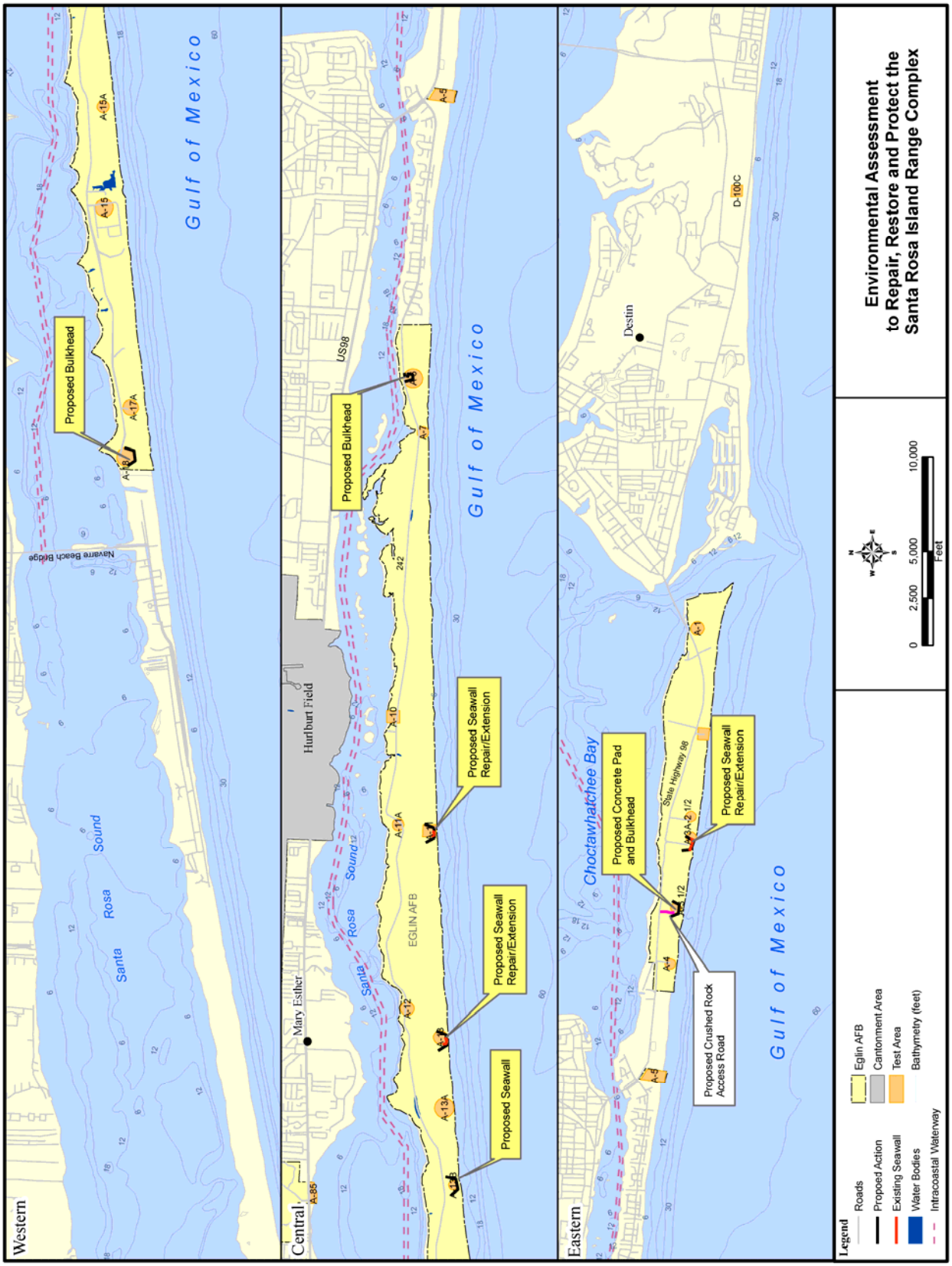

Figure 3-2. SRI Nearshore Bathymetry

The 1978/1979 Mississippi, Alabama, Florida (MAFLA) study (Dames & Moore, 1979) determined that sands dominate the eastern Gulf of Mexico. The shelf edge was characterized by 20 percent fine sand fraction, while the upper slope sediments contained up to 50 percent sand and a substantial amount of planktonic foraminiferan tests. A bulge of sediments low in carbonates and high in quartz extends out onto the shelf, demarcating the different sediment compositions of regions lying to the east and to the west. The eastern half is 90 percent carbonate and the western half is predominately quartz sand (Dames & Moore, 1979).

The area within one mile of shore is relatively flat and sandy with no apparent rock, coral or limestone outcrops. The sand and sediments are of uniform consistency.

3.4 WETLANDS

Wetlands are areas of transition between terrestrial and aquatic systems where the water table is usually at, or near, the surface, or the land is covered by shallow water (USFWS, 1979). Abiotic and biotic environmental factors such as morphology, hydrology, water chemistry, soil characteristics, and vegetation contribute to the diversity of wetland community types. The term *wetlands* describes marshes, swamps, bogs, and similar areas. Local hydrology and soil saturation largely affects soil formation and development, as well as the plant and animal communities found in wetland areas (USEPA, 1995). Wetland hydrology is considered one of the most important factors in establishing and maintaining wetland processes (Mitsch, 2000).

Wetlands are defined in the USACE, Wetlands Delineation Manual as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (USACE, 1987). The majority of jurisdictional wetlands in the United States are described using the three wetland delineation criteria; hydrophytic (aquatic) vegetation (hydrophytes), wetland (hydric) soils, and hydrology (USACE, 1987).

Due to the dynamic nature of SRI, wetlands are constantly shifting, so it is difficult to determine an exact estimate of wetland acreage. The following wetland types on SRI have been previously identified using the National Wetlands Inventory Geographic Information System (GIS) data.

- Estuarine Wetlands
- Salt Marshes
- Inland Wetlands
- Basin Wetlands
- Depression Marshes
- Freshwater Marshes

The salt marsh community is found wherever tidal salt waters have frequent access and where the direct wave action is limited. This community consists of small fringes along the northwestern margin of SRI and occurs in narrow bands along the littoral (intertidal) areas of the Island. Tree and shrub species are limited and usually consist of sea myrtle, wax myrtle, and sea oxeye. Herbaceous species include sawgrass, black needle rush, and salt marsh mallow. Soils associated with this community are level, poorly drained muck or sandy clay loams underlain by loamy sand.

The majority of the wetlands on SRI are inland wetlands, which can be categorized as basin wetlands, depression marshes and freshwater marshes, all of which have similar characteristics. These wetlands are characterized as shallow, closed basins with outlets usually only in times of high water; are composed of peat or sand substrate, are usually inundated, and exhibit woody or herbaceous wetland vegetation. The depression marshes comprise more than 90 percent of the wetlands found on SRI. Depression marshes are shallow, generally ephemeral (seasonal), rounded depressions. These wetlands are dominated by plants adapted to anaerobic substrate conditions imposed by saturation or inundation for more than 10 percent of the growing season. Peaty soil accumulates in the deepest sections where water is most permanent. Herbaceous vegetation is often found in this plant community in concentric bands (or zones).

Some small, isolated freshwater marshes occur on SRI. These are usually found in low troughs and swales behind the dune lines. Tree and shrub species are usually absent but may be found adjacent to these marshes. The vegetative community consists mostly of grasses, sedges, rushes, and other herbaceous plants. Maidencane and breakrushes are the dominant plant species present. Soils are nearly level and are very poorly drained. They are coarse, textured, or organic and are underlain with sand.

Wetlands support both aquatic and terrestrial organisms. Large varieties of microbes, vegetation, insects, amphibians, reptiles, birds, fish, and mammals can be found living in concert in wetland ecosystems. Through a combination of high nutrient levels, fluctuations in water depth, and primary productivity of plant life, wetlands provide the base of a complex food web, supporting the feeding and foraging habits of these animals for part or all of their life cycle. During migration and breeding, many nonresident and transient bird and mammal species also rely on wetlands for food, water, and shelter.

The USACE is the lead agency in protecting wetland resources. This agency maintains jurisdiction over federal wetlands (33 Code of Federal Regulations [CFR] 328.3) under Section 404 of the CWA (30 CFR 330) and Section 10 of the Rivers and Harbors Act (30 CFR 329). The USEPA assists the USACE (in an administrative capacity) in the protection of wetlands (40 CFR 225.1 to 233.71). The state of Florida regulated wetlands under the Wetlands/Environmental Resource Permit program under Part IV, Florida Statutes Section 373. Furthermore, Executive Order (EO) 11990, Protection of Wetlands, offers additional protection to these resources. In addition, the USFWS and the National Marine Fisheries Service (NMFS) have important advisory roles. At the state level, wetland resources are afforded regulatory protection under the

FDEP's Chapter 62-312, Dredge and Fill Program. This agency issues a Section 401 Certification under the authority of the CWA (40 CFR 230.10(b)).

3.5 FLOODPLAINS

EO11988, Floodplain Management (1977, 42 Fed. Reg. 26951) defines floodplains as "the lowland and relatively flat areas adjoining inland and coastal waters including flood prone areas of offshore islands, including at a minimum, that area subject to a one percent or greater chance of flooding in any given year." Areas with a one percent chance of being flooded in any given year are designated Special Flood Hazard Areas (SFHA). Federal Emergency Management Agency (FEMA) previously referred to these areas as the 100-year floodplain (FEMA, 2004).

EO 11988 requires federal agencies to avoid adverse impacts associated with the occupancy and modification of floodplains and to avoid floodplain development whenever possible. Additionally, EO 11988 requires federal agencies to make every effort to reduce the risk of flood loss, minimize the impact of floods on human health, safety, and welfare, and preserve the natural beneficial value of floodplains. The order stipulates that federal agencies proposing actions in floodplains consider alternative actions to avoid adverse effects, avoid incompatible development in the floodplains, and provide opportunity for early public review of any plans or proposals.

All of the SRI Range Complex is within a SFHA (Figure 3-3). The Gulf coast, including the SRI Range Complex, is also designated as a Zone V, which is a FEMA flood insurance rate zone corresponding to coastal floodplains subject to hazards from storm waves. The federal government allows development within SFHAs as long as the development complies with local, state and federal floodplain management ordinances (FEMA, 2004).

Figure 3-3. SRI Floodplain and Special Flood Hazard Areas

3.6 PUBLIC ACCESS

Public access pertains to the temporary or permanent closure of SRI areas to the public. The purpose of restricting access to the public is to ensure their safety. Limits on public access to recreation areas and waterways create a nuisance and can impact the regional economy. The Air Force has permanently closed the western portion of Eglin AFB SRI property to public access and recreation. The eastern 4-mile beach segment of SRI allows limited public access and is a valued tourist destination. However, the landward extent of Air Force-owned property on SRI is the MHWL. The general public understands that Eglin AFB controls this area and permits recreational activities when military activities allow. Peak recreational public use of the area occurs during the summer months with highest use during the middle of the day.

SRI access restrictions affect activities in the water that include commercial fishing, commercial shipping, and recreational watercraft. Although the quantity of private recreational boats significantly exceeds the number of commercial craft in the SRI area, waterway restrictions on shipping and commercial fishing create the greatest potential economic impacts regionally. Restrictions impacting boating on the inland waterway and/or the near shore area of the Gulf of Mexico are coordinated with the U.S. Coast Guard, the U.S. Army Corps of Engineers, the USFWS, and the NMFS (USAF, 2005a).

3.7 SOCIOECONOMICS

The following resources are addressed under socioeconomics: tourism, recreational fishing, commercial fishing, and commercial shipping.

3.7.1 Tourism

The coastal zone of the northern Gulf is one of the major tourist and recreational regions of the U.S., especially for marine fishing and beach activities. Recreational resources include coastal beaches, barrier islands, estuarine bays and sounds, river deltas, and tidal marshes. Many of the areas used for recreational purposes are held in trust for the public under federal, state, and local jurisdiction as parks and landmarks. Commercial facilities such as resorts and marinas are also primary areas for tourist activity. Within the project area, tourist access is limited to 4 miles of Eglin owned-beach on near TS A-3.

Economically, tourism provides over $1 billion to the annual economy for Okaloosa County, with visitors numbering 4.5 million. Over 35,000 local residents are employed in the tourism industry (Economic Development Council of Okaloosa County, Florida, 2006).

3.7.2 Recreational Fishing

The Gulf waters are estimated to support more than 40 percent of the nation's marine recreational fishing, with 4.8 million anglers in 2002 who caught an estimated 163 million fish during more than 11 million individual fishing trips. Nearly 117 million of the fish were caught from private/rental boats, over 6 million from charter boats, and 39 million from the shore (USDOC, 2004).

Pleasure boats comprise over 95 percent of all registered boats, with concentrations in Bay, Escambia, Okaloosa, and Santa Rosa counties.

In the Gulf, recreational fishing activities typically occur within 3 miles of the shoreline, with anglers fishing from shore or from private or charter boats. Recreational fishing activities also include fishing from charter boats that go into deep water. Party boats fish primarily over offshore hard bottom areas, wrecks, or artificial reefs for amberjack, barracuda, grouper, snapper, grunts, porgies, and sea bass.

Fishing tournaments make a sizeable contribution to the Florida economy in general and particularly to the local economies of various communities, including those in the panhandle. Tournaments not only bring in direct revenue from the participants, but they also generate income for local businesses as well.

3.7.3 Commercial Fishing

The Gulf of Mexico is the single most important commercial fishing area in the United States (USDOC, 1998). Commercial fishing in the Gulf in 2000 produced over 1.79 billion pounds of fish valued at over $990 million (Davis et al., 2000). Florida's west coast ranked third among the Gulf States of Louisiana, Mississippi, Texas, and Alabama with over 75 million pounds valued at $156 million. Apalachicola is the closest major commercial fishing port to the project area. The primary targeted commercial fisheries associated with this port are oysters/shrimp with 10.3 million pounds valued at $11.4 million in 2000.

Almost 23 million pounds of fish were landed by commercial fishing operators in northwest Florida counties in 2001. The largest share (almost 65 percent) of the landings was comprised of finfish, followed by invertebrates (20 percent), and shrimp (15 percent). Gulf County contributes the largest share (45 percent) of the total landings, followed by Bay County (18 percent). Counties within the project area, Okaloosa and Santa Rosa contribute comparatively less in terms of commercial fish landings.

3.7.4 Commercial Shipping

The Port of Pensacola (Escambia County) and the Port of Panama City (Bay County) are the closest commercial shipping ports to the Proposed Action. Approximately 45 percent of U.S. shipping tonnage passes through six deepwater Gulf ports. The Gulf of Mexico supports the second largest marine transport industry in the world. In 1999 more than 234,000 trips were taken upbound and downbound in the Gulf Intracoastal Waterway (GIWW), which runs through Santa Rosa Sound, which borders the north shore of SRI. In 1999, over 109.6 million tons of commodities were shipped through the Gulf portion of the GIWW (USACE, 1999).

3.8 HAZARDOUS MATERIALS AND SOLID WASTE

3.8.1 Hazardous Materials

According to the Resource Conservation and Recovery Act (RCRA), 42 USC 6903(5), hazardous materials and waste are defined as substances that, because of "quantity, concentration, or physical, chemical, or infectious characteristics may cause or significantly contribute to increases in mortality or serious illnesses, or pose a substantial threat to human health or the environment." Hazardous materials as referenced here pertain to hazardous chemicals or substances meeting the requirements found in 40 CFR 261.21.24, are regulated under RCRA, and are guided by Air Force Instruction (AFI) 32-7042. The hazardous materials transported to and used on site for the Proposed Action consists of fuels.

Under federal law, the transportation of hazardous materials is regulated in accordance with the Hazardous Materials Transportation Act, 49 United States Code (U.S.C.) 1801 et. seq. For the transportation of hazardous materials, Florida has adopted federal regulations that implement the Hazardous Materials Transportation Act, found at 49 CFR 178.

State laws pertaining to hazardous materials management include the Florida Right-to-Know Act, Florida Statutes Title 17, Chapter 252, the Hazardous Waste section of the FDEP and the Florida Department of Transportation Motor Carrier Compliance Department that implements 49 CFR 178 under Florida statute annotated Title 29 Section 403.721.

Air Armament Center (AAC) Plan 32-9, Hazardous Materials Management, describes how Eglin complies with federal, state, Air Force, and DoD laws and instructions. All Eglin AFB organizations, tenants and contractors are required to follow this plan.

Environmental Restoration Program

Eglin AFB uses the Environmental Restoration Program (ERP) to identify, characterize, and remediate past environmental contamination on Air Force installations. Although widely accepted at one time, the procedures followed for managing and disposing of wastes resulted in contamination of the environment. The ERP has established a process to evaluate past disposal sites, control the migration of contaminants, identify potential hazards to human health and the environment, and remediate the sites. Regulations affecting ERP management at Eglin integrate investigative and remedial protocols of the processes under the Comprehensive Environmental Response, Compensation, and Liability Act and RCRA, as well as state environmental compliance programs, primarily those found in FAC 62-770, Petroleum Contamination Site Cleanup Criteria. Digging activities are coordinated with the Environmental Restoration Branch, 96 CEG/CEVR. The Eglin AFB Environmental Restoration Program Management Action Plan (USAF, 2003a) addresses the plans to manage ERP sites on the base.

ERP/Areas of Concern (AOC)/Points of Interest (POI) Sites Located at SRI

There are currently five ERP sites, seven AOCs, and four POIs on SRI (USAF, 2003a), which are summarized in Table 3-3 and shown in Figure 3-4. Additional information on site descriptions is provided in Appendix E.

More detailed information regarding the site description and status of ERPs, AOCs, or POIs can be found in Eglin AFB's *Installation Restoration Management Action Plan*, July 2003, or by contacting the Restoration Section of Environmental Management at Eglin AFB.

3.8.2 Solid Waste

The Solid Waste Disposal Act (42 U.S.C. 3251 et seq.) established guidelines for solid waste collection, transport, separation, recovery, and disposal systems. The RCRA (42 U.S.C. 6901 et seq.) amended this act by shifting the emphasis from disposal to recycling and reuse of recoverable materials. Florida also has solid waste management regulations pertaining to solid waste facilities, state resource recovery and management programs, certification of resource recovery equipment, used oil and domestic sludge classification, utilization, and disposal criteria. FDEP develops and adopts rules that govern proper management of solid waste in the state. Most of the responsibility for solid waste management under the law rests with local governments. Generally, counties operate the solid waste disposal facilities to serve the cities and towns within their jurisdictions. This project is subject to federal, state, local, and Air Force regulations, since the Proposed Action would occur on Air Force property. If there are conflicting regulations or procedures and protocols, the most stringent would be used.

Florida solid waste management regulations include the following:

- **Florida Solid and Hazardous Waste Management Act (Florida Statutes 29 Chapter 403):** Requires that counties establish and operate solid waste disposal facilities and that each county implement a recycling program to achieve reduction of levels in the disposal of solid waste.
- **Florida Resource Recovery and Management Regulations (FAC 62-7):** Establish local resource recovery and management programs and regulate the collection, transport, storage, separation, processing, recycling, and disposal of solid wastes including sludge.
- **Florida Solid Waste Disposal Facility Regulations (FAC 62-701):** Establish regulations for the construction, operation, and closure of solid waste facilities.

Florida landfills are designated as Class I, II, or III. Class I landfills receive an average of 20 tons or more of solid waste per day (if weighed by scale), or 50 cubic yards or more of solid waste (as measured in place after covering). The permitting requirements for Class II landfills are the same as Class I landfills; Class II landfills are smaller. Class III landfills receive C&D debris, asbestos, carpet, cardboard, paper, glass, plastic, furniture other than appliances, and other materials that are not expected to produce leachate.

Table 3-3. Environmental Restoration Program Sites at Santa Rosa Island

Site Designation	Site Name	Site Location	Site Status
ERP LF-22	A-11A Disposal Site	South of Hurlburt Field on SRI, approximately 6.9 miles west of the base gate	Currently, no action is taking place at site. NFA is planned for the site.
ERP RW-42	Low-Level Radioactive Waste Site/Drum Burial	Western side of the A-15 compound	NFA
ERP SS-74	Officers' Beach Club	Site A-3 approximately 100 meters northeast of the former Officers' Beach Club	NFA
ERP SS-76	Radar Surveillance Site	Site A-17 approximately 2 miles east of Navarre Bridge on Eglin Road 242	NFA
ERP ST-259	Eglin Water Tower No. 12511	On SRI north of Range Road 242 and across the road from Building No. 12510	Response actions scheduled for completion in 2006.
AOC-2	A-15 Former Power Plant Facility	Near northwest corner of A-15 Compound on SRI	File Closed
AOC-42	VORTAC Generator Spill Site	Eastern end of SRI	File Closed
AOC-43	BOMARC launch facility	A-15	File Closed
AOC-82	A-15 Compound Disposal Area	Near southwest corner of A-15 Compound on SRI	File Closed
AOC-85	A-15 Compound Fire Training Area	Near northwest corner of A-15 Compound on SRI	File Closed
AOC-94	A-11 Storage Bunkers	A-11 Compound on SRI	File Closed
AOC-95	Abandoned Radar Site Pipeline	Between a pier protruding in the Santa Rosa Sound and A-15	File Closed
AOC-111	A-15 Compound Neutralization Site	Near northwest corner of A-15 Compound on SRI	File Closed
POI-322	Site A-15 PCB Cleanup	Eglin A-15 Compound, SRI	File Closed
POI-356	A-11 Storage Bunkers UST	A-11 Compound, SRI	File Closed
POI-405	Test Area A-15	A-15	File Closed with Internal Land Use Controls (96CEG/CEVR must be contacted prior to activities around the site).
POI-501	Former A-7 Radar Facility POL Site	SRI former A-7 Compound	File Closed

Source: USAF, 2003a; Bjorklund, 2006.
PCB = Polychlorinated Biphenyl; POL = Petroleum, Oil, and Lubricants; NFA = No Further Action; SI = Site Investigation; UST = Underground Storage Tank

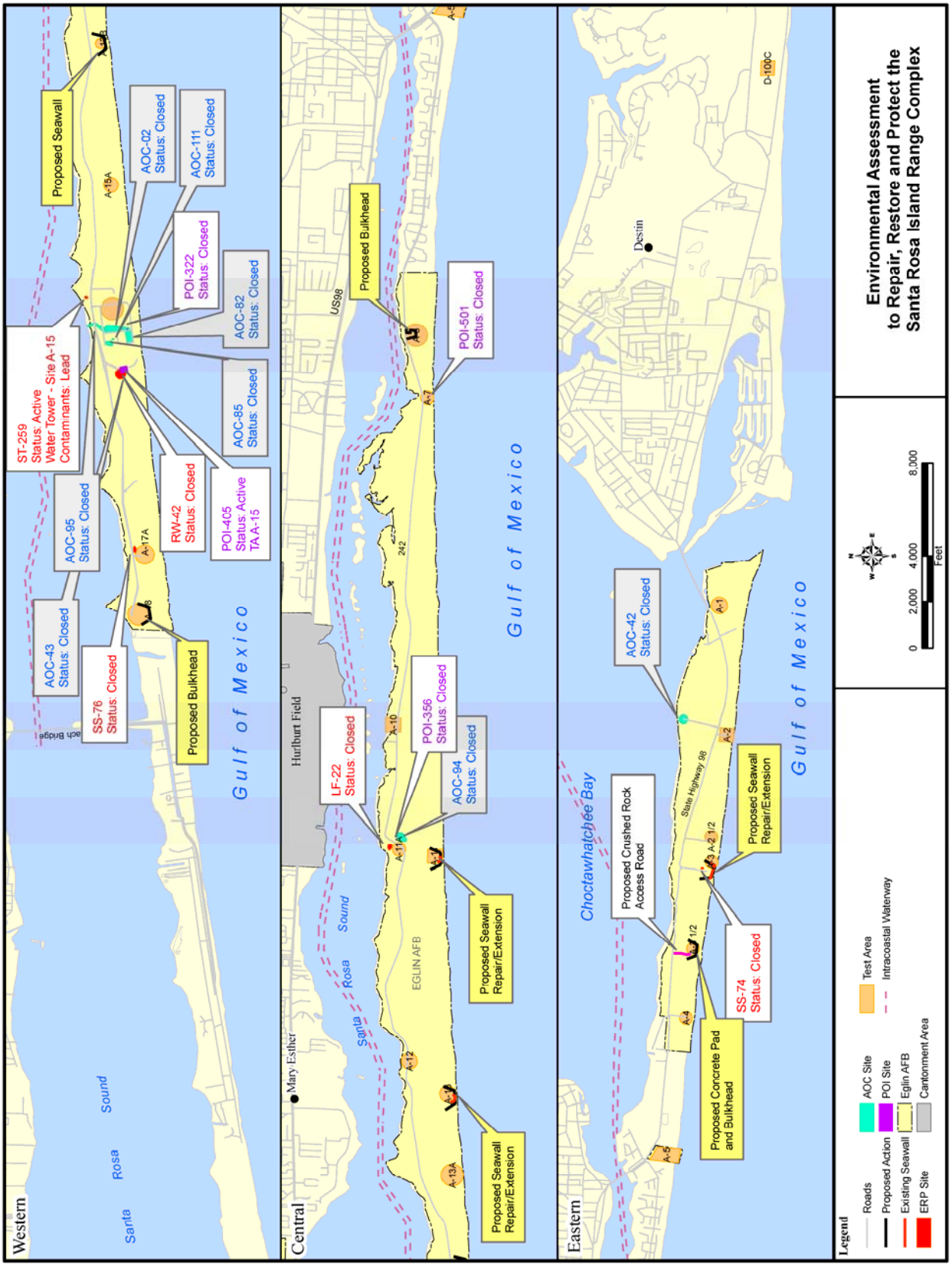

Figure 3-4. SRI ERP Sites

Air Force Policy Directive (AFPD) 32-70, Environmental Quality establishes Air Force regulatory requirements and solid waste management. AFPD 32-70 requires compliance with applicable federal, state, and local environmental laws and standards. AFI 32-7042 implements solid waste, AFPD 32-70.

AFI 32-7042 requires that each installation have a solid waste management program that includes a solid waste management plan that addresses handling, storage, collection, disposal, and reporting of solid waste. AFI 32-7080 contains the solid waste requirement for preventing pollution through source reduction, resource recovery, and recycling. At Eglin AFB, Environmental Management directs the solid waste management program.

Local Solid Waste Disposal

Local solid waste is recycled or disposed of in landfills in Okaloosa, Walton, and Santa Rosa Counties. All landfills in this area are located, operated, and maintained by the respective county or privately operated. FDEP has permitted all landfills. Since the project would occur in Okaloosa and Santa Rosa County the debris would be taken to Okaloosa and Santa Rosa County landfills.

Okaloosa County operates a Class I landfill near Baker, which is used for disposal of municipal solid waste generated in the northern part of the county, including Crestview. The county also operates a yard trash mulching facility at the Wright Landfill located on out-leased land on Eglin AFB. Three privately owned C&D debris landfills are located within Okaloosa County: Waste Recyclers, Point Center, and Arena Landfills.

Santa Rosa County owns and operates two landfills. The Central Landfill is a Class I facility, which primarily serves the central portion of the county and, prior to Hurricane Ivan in 2004, received approximately 175 tons per day. A Class III facility is also located at the Central Landfill, making the total size approximately 550 acres. The life expectancy of the Central Landfill was estimated at Year 2075 prior to Hurricane Ivan. The timeline for the landfill is currently being reevaluated (USAF, 2005). Four privately owned C&D debris landfills are located within Santa Rosa County: Coyote Navarre, Joiner Fill Dirt Inc., Persimmon Hollow, and Tower Ridge C&D Landfills.

Table 3-4 lists the average annual amounts of C&D debris taken to C&D landfills in Okaloosa and Santa Rosa Counties from 2000 to 2004.

Table 3-4. C&D Debris Generated (in tons) in Okaloosa and Santa Rosa Counties

Year	Okaloosa County	Santa Rosa County
2000	36,414	89,954
2001	42,487	138,880
2002	45,654	102,652
2003	64,758	No data available
2004*	201,265	44,029
Average	78,116	102,600

Source: USAF, 2005

*Hurricane Ivan devastated the northwest Florida Gulf coast in September 2004, causing a dramatic increase in the amount of debris being taken to area landfills in 2004 and 2005.

Hurricane Ivan was a Category III storm that struck the Florida's Gulf Coast in September 2004. It wrought massive destruction of personal and public property, resulting in an increase in the amount of C&D debris generated in 2004–2005 for Santa Rosa County, Okaloosa County, and to a lesser extent, Walton County. However, after interviewing several of the area C&D landfill owners or employees (Waste Recyclers, Point Center, Arena), the life expectancies of the C&D landfills remain high (USAF, 2005). The Point Center landfill owner predicts the landfill to have 25 to 30 years of capacity remaining (USAF, 2006). For Arena landfill, the prediction is at least 18 to 20 years of capacity (USAF, 2005). The Santa Rosa County landfill continues to experience high rates of disposal for C&D debris eight months after the hurricane. Before determining the final impact to the capacity of the landfill, officials are waiting for the rates of disposal to level out to pre-Hurricane Ivan levels (USAF, 2005).

3.9 CULTURAL RESOURCES

As a Federal agency, Eglin AFB is legally required to consider the effects its actions may have on historic properties. These requirements are considered under AFI 32-7065 (USAF 2004). Mandating Federal regulations are the Antiquities Act of 1906, the Historic Sites Act of 1935, National Environmental Protection Agency (NEPA) of 1969, the NHPA of 1966 as amended, 36 CFR Part 800, the Archaeological and Historic Preservation Act of 1974 (AHPA), the Archaeological Resources Protection Act of 1979 (ARPA), the Native American Graves and Repatriation Act of 1990 (NAGPRA), and the American Indian Religious Freedom Act (AIRFA). The act that is most directly influences cultural resources management at Eglin is the NHPA (USAF, 2004).

The NHPA of 1966 was enacted to set federal policy for managing and protecting significant historic properties. Federal agencies must identify historic properties and consult with the Advisory Council on Historic Preservation and SHPO (USAF, 2004). Section 106 of the NHPA requires that federal agencies analyze the impacts of federal activities on historic properties, or cultural resources included in, or eligible for inclusion in, the National Register of Historic Places (NRHP). Section 110 of the NHPA requires that federal agencies inventory any cultural resources that are located on their property or within their control and to nominate those found to be significant for inclusion into the National Register.

3.9.1 Terrestrial Resources

One hundred and eighty-two identified cultural resources are located on SRI within Eglin AFB controlled areas. Eglin AFB controls this entire area (4,760 acres), which has been formally surveyed for cultural resources. As a result, no additional archaeological reconnaissance survey would be required prior to construction and dune restoration activity. However, areas which do contain known resources that are eligible or potentially eligible for listing, or listed on the NRHP, would need to be considered for impacts when located in areas that intersect with the Proposed Actions.

Of these 182 resources, 89 are archaeological sites and 93 are historic structures. The 89 archaeological sites include both historic and prehistoric components, isolated finds and many

20th century military sites (See Appendix C, Table C-1). Of these, 12 sites are considered eligible to the NRHP; 12 sites are considered potentially eligible; 8 have no evaluation listed; 2 are currently under SHPO review for evaluation; and 55 are considered ineligible to the NRHP and require no additional work.

The 93 historic buildings and structures described in cultural resource data files consist almost entirely of Cold War period construction (1946-1989). Many of these structures were constructed in support of the BOMARC missile program or the JB-2 development program (See Appendix C, Table C-2). Thirty-four of these structures have been demolished and require no additional consideration. Of the remaining 59 buildings; 23 are considered eligible to the NRHP; 2 are considered potentially eligible to the NRHP; 5 are currently under SHPO eligibility review and 29 are considered ineligible to the NRHP.

3.9.2 Marine Cultural Resources

The protection of Gulf submerged traditional cultural properties falls within federal and state jurisdiction, nine nautical miles (nm) into the Gulf. The possibility exists that within these 12 miles, submerged prehistoric sites and historic resources such as shipwrecks could exist. The shoreline and offshore area is under the jurisdiction of the U.S. Department of the Interior (DoI). Eglin Environmental Management and Historic Division coordinates Section 106 of the NHPA with the Florida SHPO and Minerals Management Service (MMS) of the Outer Continental Shelf (OCS) Region, DoI. Below is a brief review of relevant information pertaining to cultural resources management plans for these regulating agencies.

There are three main Acts that address submerged cultural resources: the NHPA, the Abandoned Shipwreck Act, and the Florida Historical Resources Act. Section 106 of the NHPA, 1966, as amended, applies to submerged as well as terrestrial cultural resources. Section 106 requires all Federal agencies identify any historic properties that any undertaking has the potential to affect, and seek ways to avoid or minimize any adverse effects on these historic properties. Furthermore, eligibility into the National Historic Register must be determined. The Exclusive Economic Zone (EEZ) extends 200 nm from the shoreline and is under the jurisdiction of the DoI. The Abandoned Shipwreck Act of 1987 gives the title and jurisdiction over historic shipwrecks to the federal government extending to the EEZ. This applies even if the ship is within state waters. Before engaging in an activity that may negatively affect a shipwreck, this Act requires consideration of the effect the activity may have, often mandating preservation. The Florida Historical Resources Act protects sites on state-owned land and submerged land within the Gulf. Any excavation or disturbance of a site requires a permit or contract from the Division of Historical Resources, Bureau of Archaeological Research (USAF, 2005).

The Historic Preservation Plan for Eglin AFB contains no guidance regarding the management of the resources within the over water ranges; however, Eglin Cultural Resources is responsible for identifying resources and impacts within the 12-mile offshore area. Consultation procedures cited in *The Management Plan for Florida's Submerged Resources* parallel NHPA Section 106 procedures with added emphasis on the protection of submerged resources through avoidance. For portions situated outside state waters, the MMS/OCS, DoI developed *Handbook for Archaeological Resource Protection* contains prehistoric and historic high-probability zones and

guidelines for the identification of submerged cultural resources. These guidelines specify the investigation techniques required to identify potential historic and prehistoric resources in the high probability zones (USAF, 1996).

3.9.3 Existing Environment

Historic resources investigations have been conducted at East Pass since the early 1980's. An underwater survey of the entrance channel was conducted in June 1983. The Florida SHPO concurred with the report in August 1983. Given the recent construction of the project (1952) and the results of the literature search indicating no cultural resources in the area and magnetometer survey of the entrance channel, there appears to be virtually no potential for submerged historic properties near the eastern end of the project area (East Pass).

Additionally, a recent site file search with the Florida Master Site Files concurs that no cultural resources have been identified within the offshore sand source area. However, Eglin Cultural Management Division GIS data does show that two underwater sites, presumably shipwrecks, do exist.

3.10 NOISE

Noise is sound that interferes with normal activities or that otherwise diminishes the quality of the environment. It may be intermittent or continuous, steady or impulsive, stationary or transient. Stationary sources are normally related to specific land uses (for example, a factory). Transient noise sources move through the environment, either along relatively established paths (for example, highways and railroads), or randomly. There is wide diversity in responses to noise that not only vary according to the type of noise and the characteristics of the sound source, but also according to the sensitivity of the receptor (a person or animal), the time of day, and the distance between the noise source and the receptor.

The physical characteristics of noise, or sound, include its intensity, frequency, and duration. Sound is created by acoustic energy, which produces minute pressure waves that travel through a medium, like air, and are sensed by the ear drum. As the acoustic energy increases, the intensity or amplitude of these pressure waves increase, and the ear senses louder noise. The unit used to measure the intensity of sound is the decibel (dB). Sound intensity varies widely (from a soft whisper to a jet engine) and is measured on a logarithmic scale to accommodate this wide range.

The frequency of sound is measured in cycles per second, or hertz (Hz). This measurement reflects the number of times per second the air vibrates from the acoustic energy. Low frequency sounds include thunder and explosions. High frequency sound examples include whistles, birds chirping and sonar pings. Sound measurement is further refined through the use of "A-weighting." The normal human ear can detect sounds that range in frequency from about 20 Hz to 15,000 Hz. However, all sounds throughout this range are not heard equally well. Therefore, through internal electronic circuitry, some sound meters are calibrated to emphasize frequencies in the 1,000 to 4,000 Hz range. The human ear is most sensitive to frequencies in this range, and sounds measured with these instruments are termed "A-weighted," and are shown

in terms of A-weighted decibels (dBA). The duration of a noise event, and the number of times noise events occur, are also important considerations in assessing noise impacts.

3.10.1 Existing Noise Environment

Santa Rosa Island

Wind and surf are the major natural sound sources on SRI. Anthropogenic noise sources include vehicles and aircraft supporting the various military missions on SRI.

Gulf of Mexico

Ambient (natural) noise in the ocean may arise from natural sources: wind action on the sea surface, rain or hail striking the sea surface, and various types of marine life. Ambient noise sources may be continuous and persistent, or transient and intermittent. In open oceans, the primary persistent natural noise source tends to be wind action on the sea surface (Figure 3-5).

Anthropogenic (man-made) sound within the project area consists of commercial and recreational vessel traffic, military operations onshore and dredging. In open oceans, the primary persistent anthropogenic noise source tends to be commercial shipping (Figure 3-5). Surface ships generate noise via a number of mechanisms, the most important being propeller blade cavitation.

Ambient and current anthropogenic noise in the northern Gulf of Mexico ranges from approximately 40 dB to about 110 dB. To allow comparison, all of the different sounds were modeled using decibels referenced to a common pressure (1 microPascal) and a common distance (1 m). Figure 3-5 illustrates the variability from all of the potential ambient and anthropogenic noise sources described in this paragraph. The frequencies of the noise sources are provided along the X-axis with the ambient noise levels for the sources plotted along the Y-axis. The noise levels depicted in this graphic are not additive among the various sources and are not weighted for human hearing sensitivity. In the northern Gulf, the lower range on average ambient and current anthropogenic noise is defined at the low frequencies by shipping noise in regions outside the shipping lanes. At high frequencies, the lower range is defined by wind noise at low wind speeds. Other factors can contribute to ambient noise and can raise noise levels on an intermittent basis. The onset of rain raises high-frequency noise levels by 10 dB or more. Marine life of various types can raise noise levels near 20 Hz (marine mammals), in the range of a few kilohertz (kHz) (crustaceans and fish), and in the tens to hundreds of kHz (again, marine mammals). While the occurrence of biologic noise is limited in time and location, when present, noise levels up to 30 dB greater than background levels can be produced.

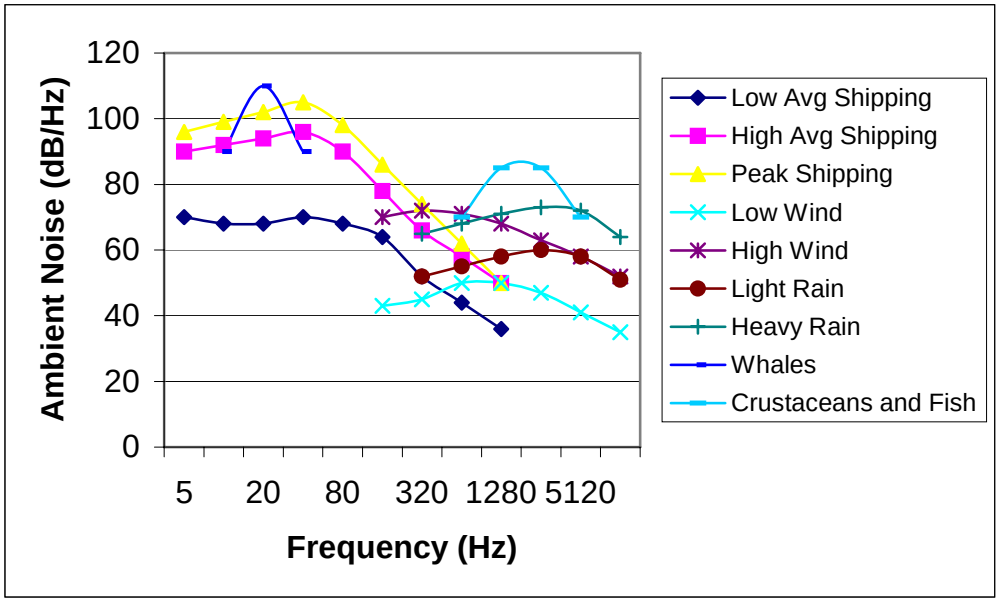

Figure 3-5. Ambient Noise Level Bounds in the Northern Gulf of Mexico
(ANDES Noise Model, Renner, 1995)

3.11 BIOLOGICAL RESOURCES

This section describes biological resources found on the terrestrial (land) areas of SRI and in the marine waters adjacent to the island. Emphasis is placed on identifying sensitive habitats and species that are within federal and/or state mandates or are of special concern.

3.11.1 Terrestrial Biological Resources

Barrier Island Ecological Association

A classification system of ecological associations has been developed based on flora, fauna, and geophysical characteristics. These ecological associations are described in the *Integrated Natural Resources Management Plan*, Eglin AFB, (USAF, 2002). SRI falls under the barrier island ecological association, and its entire terrestrial area is classified as Coastal Upland Community. Within this community are sand beaches, beach dunes, coastal grassland, coastal interdunal swales, mesic flatwoods, and scrub communities. The plant species normally found in the ecological communities of SRI are listed in Table 3-5.

Sensitive Habitats

Sensitive biological habitat found on the Eglin portion of SRI include critical habitat for sensitive species as the USFWS identifies.

Table 3-5. Plant Species Commonly Found in the Barrier Island Ecological Association

Beach Dune	
Sea oats	*Uniola paniculata*
Sea rocket	*Cakile constricta*
Beach elder	*Iva imbricata*
Evening primrose	*Oenothera humifosa*
Milk pea	*Galactia microphylla*
Godfrey's goldenaster	*Chrysopsis freyi*
Seashore paspalum	*Paspalum distichum*
Beach elder	*Iva imbricata*
Beach cordgrass	*Spartina patens*
Beach morning glory	*Ipomoea stolonifera*
Bitter panicum	*Panicum amarum*
Mesic Flatwoods	
Cabbage palms	*Sabal palmetto*
Slash pine	*Pinus elliotti*
Willow	*Salix floridana*
Sawgrass	*Clamadium jamaicense*
Vines	*Vitis munsoniana*
Vines	*Mikania cordiflolia*
Shrub	*Myrica cerifera*
Yaupon holly	*Ilex vomitoria*
Fetterbush	*Lyonia lucida*
Gallberry	*Ilex glabra*
Wicky	*Kalmia hirsuta*
Mint	*Conradina canescens*
Lichens	*C. leporina and C. perforata*
Scrub	
Rosemary	*Ceratiola ericoides*
Saw palmetto	*Serenoa repens*
Slash pine	*Pinus elliotti*
Scrub oaks	*Quercus geminata, Q. myrtifolia*
Lichens	*Cladonia leporina, Cladina evansii*
Woody goldenrod	*Chrysoma pauciflosculosa*

Coastal Interdunal Swale	
Centalla	*Centalla asiatica*
Umbrellagrass	*Fuirena scirpoidea*
Beakrush	*Rhynchospora sp.*
Elliot's yellow-eyed grass	*Xyrus elliotii*
Club moss	*Lycopodium appressum*
Sawgrass	*Clamadium jamaicense*
White-topped sedge	*Dichromena colorata*
Ludwigia	*Ludwigia alata*
Nutrush	*Scleria verticillata*
Seashore paspalum	*Paspalum distichum*
Gulf cordgrass	*Spartina spartinae*
Marsh elder	*Iva frutescens*
Muhly grass	*Muhlenbergia capillaris*
Beach cordgrass	*Spartina patens*
Saltbush	*Baccharis halimifolia*
Sand pine	*Pinus clausa*
Sand live oak	*Quercus geminata*
Lichen	*Cladonia leporina*
Perforate lichen	*Cladonia perforata*
Spoon-leaved Sundew	*Drosera intermedia*
Maritime Hammock	
Live oaks	*Quercus virginiana*
Cabbage palms	*Sabal palmetto*
Magnolia	*Magnolia grandiflora*
Buchthorn	*Bumelia reclinata, B. lanuginosa*
Wild olive	*Ilex vomitoria*
Yaupon holly	*Osmanthus americanus*
Red cedar	*Juniperus silicicola*
Saw palmetto	*Serenoa repens*
Scrub oak	*Quercus geminate*
Soapberry	*Sapindus marginatus*

Source: Johnson et al., 1992

Piping Plover Critical Habitat

The ESA defines critical habitat as specific areas within or outside the geographical area occupied by the listed species that contain physical or biological features essential to the species' conservation and that may require special management considerations or protection. On SRI, critical habitat has been designated for over-wintering piping plovers.

The preservation of critical habitat in winter foraging areas is important to the survival of piping plover populations. Quality winter foraging and roosting is necessary if adults are to survive, migrate back to breeding sites, and nest successfully. Critical habitat designation for wintering and breeding grounds for the piping plover was published in the Federal Register on 10 July

2001. Within Eglin administered property, critical habitat for wintering plovers is situated on the north shore of SRI near TS A-18 (Figure 3-6). Due to the changing morphology of the shoreline at SRI, the boundaries of critical habitat are subject to change. Guidelines published in the Federal Register should be referenced if there is any question regarding boundaries.

Sensitive Species

Sensitive species include those with federal endangered or threatened status, federal candidate species, and state endangered, threatened, and species of special concern status. An endangered species is one that is in danger of extinction throughout all or a significant portion of its range. A threatened species is any species that is likely to become endangered in the future throughout all or a significant portion of its range due to loss of habitat, anthropogenic effects, or other causes. Federal candidate species and all state listed species are those that should be given consideration during planning of projects, but have no protection under the ESA. Once legally protected, it is a federal offense to "take" (import, export, kill, harm, harass, possess, or remove) protected animals from the wild without a permit.

Under 16 USC 1531 to 1544; 1997-Supp; Endangered Species Act 1973, Federal agencies must ensure that their actions (including permitting) do not jeopardize the continued existence of any endangered or threatened species or destroy or adversely modify the habitat of such species without a permit, and must set up a conservation program. A Section 7 consultation with the USFWS would be required if a take, which is defined as pursuing, molesting or harming a protected species, were to occur. If the Proposed Action is likely to adversely affect a federally protected species, the USFWS would determine whether jeopardy or non-jeopardy to the species population would occur. As a result, Air Force projects that may affect, either directly or indirectly, federally protected species, species proposed for federal listing, and critical habitat for protected species are subject to Sections 7 and 10 of the ESA prior to the irreversible or irretrievable commitment of these resources.

The Eglin Natural Resources Section (96 CEG/CEVSN) protects numerous plant and animal species through habitat management, specifically through the management of habitats and species identified as conservation targets by The Nature Conservancy (Sutter et al., 2001). By addressing the needs of conservation targets, which include sensitive, important, and unique habitats and species, the 96 CEG/CEVSN indirectly supports the management of other species and habitat, including state listed species. Table 3-6 lists sensitive species that occur on SRI. Additional detail on sensitive species is available in Appendix D.

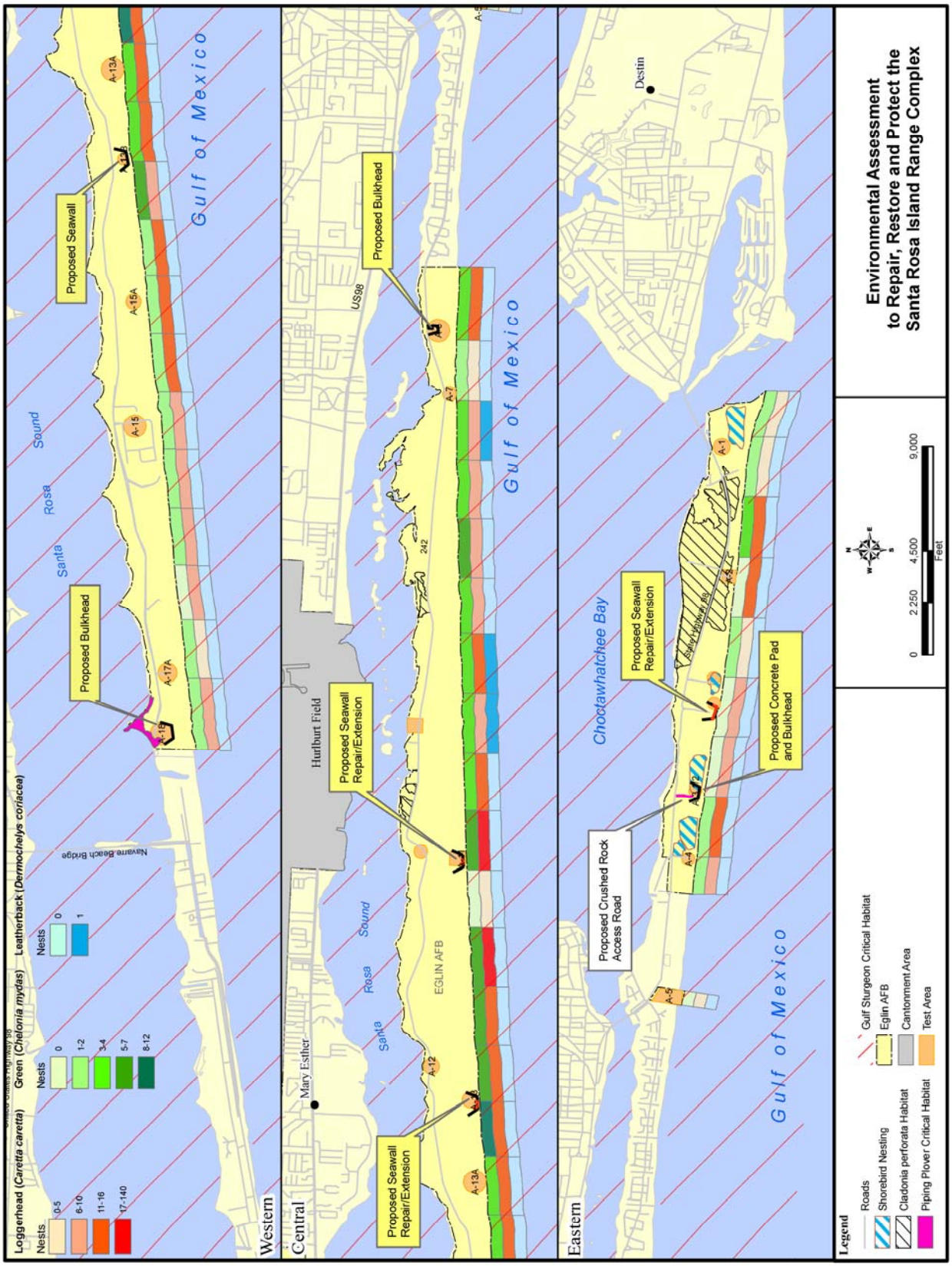

Figure 3-6. SRI Protected Species and Habitats

Table 3-6. Endangered, Threatened, and Rare Flora and Fauna Associated with SRI, Eglin AFB

Scientific Name	Common Name	Status
FISHES		
Acipenser oxyrinchus desotoi	Gulf Sturgeon	FT, SSC
REPTILES		
Caretta caretta	Loggerhead Sea Turtle	FT, ST
Chelonia mydas	Green Sea Turtle	FE, SE
Dermochelys coriacea	Leatherback Sea Turtle	FE, SE
Lepidochelys kempii	Kemp's Ridley Sea Turtle	FE, SE
BIRDS		
Charadrius alexandrinus	Snowy Plover	ST, FC
Charadrius melodus	Piping Plover	FT, ST
Egretta caerulea	Little Blue Heron	SSC
Egretta thula	Snowy Egret	SSC
Egretta tricolor	Tricolor Heron	SSC
Eudocimus albus	White Ibis	SSC
Rynchops niger	Black Skimmer	SSC
Sterna antillarum	Least Tern	ST
MAMMALS		
Peromyscus polionotus leucocephalus	Santa Rosa Beach Mouse	CT
Trichechus manatus	West Indian Manatee	FE, SE
Tursiops truncatus	Atlantic Bottlenose Dolphin	MMPA
PLANTS		
Cladonia perforata	Florida Perforate Lichen	FE, SE, CT
Drosera intermedia	Spoon-leaved Sundew	ST

FE = Federally endangered, FT = Federally threatened, FC = Federal candidate, MMPA = Marine Mammal Protection Act, CT = Eglin/ Florida Natural Area Inventories (FNAI) conservation target, SE = State endangered, ST = State threatened, SSC = State species of special concern

Invasive Non-Native Species

Invasive non-native species include plants, animals, insects, or other organisms that are not native to an area and that threaten the natural biodiversity and functioning of an ecosystem. The introduction and spread of non-native invasive species may also create significant, negative issues for military training or for other anthropogenic land uses.

Invasive non-native plant species have been documented at multiple locations on SRI. These species have the potential to out-compete and overtake native plant communities, degrade threatened and endangered species habitat, and alter natural processes such as the hydrology of wetlands. Chinese tallow, cogon grass, and torpedo grass have been prioritized as the greatest threats to SRI because of their current abundance, dispersal mechanisms, and historical documentation.

Non-native animal and insect species can affect sensitive island species. Non-native animals prey on many rare and sensitive species, compete with native species for resources, and can carry rabies and other infectious diseases that may infect native wildlife. Coyotes, red fox, feral cats, fire ants, and cactus moths are non-native invasive animal species known to inhabit SRI. Additional information on invasive non-native animal and plant species is available in Appendix D.

3.11.2 Marine Biological Resources

Surf Zone

The Proposed Action would occur on the beach face and within the surf zone, where waves break. The beach and surf zone area are subject to high-energy forces of waves and wind, and the animals living within these areas are adapted to the stresses of this environment. The natural movement of sand within this region follows seasonal patterns, with sand moving offshore in the winter and returning in the spring and summer. Surf zone species populations are also seasonal, decreasing in the winter and achieving a maximum in the summer. Wolfe et al. (1988) described the physical features and species common to the sand beach intertidal habitat of the Florida panhandle. Grain size ranged from 0.1 to 0.2 mm. Sediments in the intertidal zone are well-oxygenated due to large pore spaces and wave action. These features allow organisms to bury relatively deeply to escape heavy surf. Intertidal beach organisms tend to be suspension feeders, obtaining plankton or detritus suspended in the surf.

Species encountered in the surf zone include polychaete worms, coquina clams (*Donax* sp), amphipod and isopod crustaceans (beach hoppers or sand fleas), and ghost crabs (*Ocypode quadrata*). Fish and predatory birds feed on the smaller organisms in the surf zone (ASMFC, 2002). Among intertidal organisms, polychaetes are numerically dominant, but amphipods and ghost crabs are more visible members of the beach community. Common Gulf sand beach species are listed in Table 3-7.

Table 3-7. Common Species of Gulf Sand Beach Communities

Species Name	Common Name
Emerita talpoida	mole crab
Lepidopa benedicti	mole crab
Callianassa islagrande	burrowing shrimp
Arenaeus cribrarius	portunid crab
Scolelepsis squamata	polychaete worm
Donax sp.	coquina clam
Haustorius spp.	beach flea
Ocypode quadrata	ghost crab

Source: Wolfe et al. 1988

Ross et al. (1987) studied seasonal and daily variations of fish and invertebrates in a Gulf of Mexico surf zone. Invertebrates are animals without a backbone, while vertebrates are animals with a backbone. Six species comprised approximately 90 percent of the total sampled. Summer was the period of highest numbers and biomass. Selected species sampled with a seine net are listed in Table 3-8.

Nearshore Environment

The nearshore environment is described as the benthos (or sea bottom) and the pelagic (or water column) environments. The descriptions to follow of the northern Gulf of Mexico benthos were obtained from the MMS sponsored MAFLA OCS Baseline Environmental Surveys (Dames and Moore, 1979).

Table 3-8. Species Sampled from a Gulf Surf Zone

Species	Common Name
Harengula jaguana (A)	sardine
Anchoa hepsetus (A)	striped anchovy
Anchoa mitchelli (A)	bay anchovy
Callinectes sapidus (A)	blue crab
Anchoa nasuta (A)	longnose anchovy
Menticirrhus littoralis (A)	gulf whiting
Mugil cephalus	striped mullet
Archosargus probatocephalus	sheepshead
Arius felis	hardhead catfish
Chaetodipterus faber	Atlantic spadefish
Dasyatis sayi	bluntnose stingray
Lagodon rhomboids	pinfish
Caranx hippos	jack crevalle
Trachinotus carolinus	pompano
Menidia beryllina	tidewater silverside
Menida peninsulae	tidewater silverside

A = most abundant species collected Source: Ross et al. 1987

Benthos

Benthic invertebrates include the infauna (animals living in the substrate), such as burrowing worms and molluscs; and the epifauna (animals that live on the substrate), such as molluscs, crustaceans, hydroids, sponges, and echinoderms. Benthic habitats, or substrates, of the northeastern Gulf of Mexico consists of soft, sandy or muddy bottoms which support more infaunal invertebrates, such as polychaetes. Benthic organisms constitute an important food source for fish, shorebirds and larger invertebrate species like crabs and shrimp.

Benthic habitats experience natural fluctuations in distribution and composition. For this reason, it is sometimes difficult to assess the degree of change attributed to man-made disturbance (ASMFC, 2002). Table 3-9 lists some representative epifaunal species from the nearshore benthos.

Table 3-9. Representative Nearshore Epifaunal Species

Dominant species	Species Type
Chlamys benedicti	clam
Laevicardium pictum	clam
Sicyonia brevirostris	shrimp
Solenocera atlantidis	shrimp
Scyllarus chacei	slipper lobster
Pylopagurus coralinus	hermit crab
Palicus alternata	crab
Luidia clathrata	starfish
Ophiolepsis elegrans	brittle star

Source: Dames and Moore, 1979

Infaunal Invertebrates

Infaunal invertebrates are grouped by size with near microscopic species comprising the meiofauna and larger species comprising the macroinfauna. Nematode worms and small crustaceans called copepods comprise the majority of the meiofauna found in sandy habitats (Dames and Moore, 1979). The densities of the meiofauna, which ranged from 65 per 10 square centimeters (cm^2) to 3,952 per cm^2 in the Dames and Moore study, were observed to be higher as one moved closer to shore.

The dominant macroinfauna groups in the Gulf of Mexico include polychaete worms, crustaceans, and mollusks. The highest concentrations of these species occur inshore and decrease with increasing depth. Density is dependent on sediment grain size. The higher densities of macroinfauna are associated with course to medium sediment and grain size. Fewer numbers and different kinds of species are observed in finer sediments and silt. Dames and Moore (1979) observed the highest density and diversity at the 20 m and 40 m water depths out of all depths sampled (20 m, 40 m, 100 m and 200 m).

Pelagic Environment

The nearshore pelagic environment consists of the plankton community and the nekton community. Plankton are free-floating plants and animals varying in size from microscopic to several meters long. Nekton are free-swimming animals.

Plankton Community

Ocean currents dominate plankton movement and distribution. Plankton distribution is highly variable, characterized by spatial patchiness, as well as seasonal and inter-annual variations (MMS 1990). Plankton are an important part of the affected environment of the Proposed Action from the perspective of the recovery following a beach restoration project. The recolonization of disturbed areas occurs in part as waves and currents bring planktonic stages of animals into these areas, establishing new communities.

Three general groups comprise plankton: bacterioplankton, phytoplankton and zooplankton. The smallest individuals, the bacterioplankton, include bacteria and blue-green algae, which absorb nutrients in the water column to feed. Phytoplankton, are single-celled plants, which absorb nutrients and perform photosynthesis (convert light to food energy). Phytoplankton carbon production is the primary source of food in the trophic web of marine ecosystems. Zooplankton includes free-floating animals, which feed on phytoplankton and other zooplankton species, or in the case of larger zooplankton such as jellyfish, small free-swimming organisms. The zooplankton, represent a production secondary to phytoplankton which provides an important link between phytoplankton and higher trophic levels such as fish and marine mammals.

Fish

Fishes of the eastern Gulf inhabit all areas of the water column. Benthic and reef fishes live near the seafloor and around artificial or natural reef systems. Typical fish species associated with bottom habitats include triggerfish, toadfish, flounder, stingrays, snappers, grunts, and groupers.

Pelagic fishes, which spend most of their lives in the open waters of the Gulf, make seasonal, latitudinal (east to west) migrations along the west coast of Florida. These migrations are triggered by seasonal changes in temperature, movement of their food resources, and spawning instincts.

Cobia, and king and Spanish mackerels leave their wintering areas in south Florida to move northward in the spring along the continental shelf. Both species spawn over the continental shelf from northwestern Florida to the northwestern Gulf off Texas. The shallow portion of the continental shelf at the high-nutrient areas near river plumes is likely used for nursery areas (MMS, 1990). Table 3-10 lists some pelagic fish species that occur within the nearshore waters of the project area.

In the surf zone and nearshore areas, the highest number of fish species and largest populations are observed in the summer and early fall.

Table 3-10. Typical Pelagic Fishes Found in the Eastern Gulf

Scientific Name	Common Name
Carangidae	jacks
Clupeidae	herrings, menhaden
Coryphaenidae	dolphinfish
Mugilidae	mullets
Pomatomidae	bluefishes
Rachycentridae	cobia
Scombridae	mackerels, bonito

Protected Species and Critical Habitat

The nearshore environment off of SRI is utilized by many threatened, endangered, and special status species. Many of these are federally listed species under the ESA (Table 3-11). Five species of sea turtles (green, loggerhead, Kemp's ridley, hawksbill, and leatherback) and one marine mammal species, the West Indian manatee, are included in that number. Fishes include the Gulf sturgeon, which occurs in Gulf and adjacent estuarine waters. Another listed fish species, the smalltooth sawfish, is not expected to occur within the study area. Manatees are a rare occurrence within the study area. No further discussion is warranted for the smalltooth sawfish or the manatee.

Table 3-11. Federally Listed T&E Species within SRI Nearshore Waters

Species		Federal Status
Scientific Name	**Common Name**	
Caretta caretta	Atlantic loggerhead turtle	T
Chelonia mydas	Atlantic green turtle	E
Dermochelys coriacea	leatherback turtle	E
Lepidochelys kempii	kemp's Ridley turtle	E
Eretmochelys imbricata	hawksbill turtle	E
Trichechus manatus[a]	west Indian manatee	E
Acipenser oxyrhynchyus desotoi	gulf sturgeon	T

E – Endangered; T – Threatened
[a]Rarely sighted

Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires that federal agencies assess potential impacts to essential fish habitat (EFH) for NMFS managed commercial fisheries. In accordance with the MSA, any federal action that has the potential to adversely affect EFH requires consultation with the NMFS. As defined in section 3 of the MSA, fish includes finfish, mollusks, crustaceans, and all other forms of marine animal and plant life, other than marine mammals and birds. EFH is described as those waters and substrate necessary for fish spawning, feeding, or growth to maturity (NMFS, 2004). Various types of communities, including diverse physical and biological features, are considered EFH. EFH communities range from naturally occurring hard-bottom areas and artificial reefs to floating mats of *Sargassum sp.* (brown-algae).

Fish habitat utilized by a species can change with life history stage, abundance of the species and competition from other species, and environmental variability in time and space. The type of habitat available, its attributes, and its functions are important to species productivity and societal benefits. Some potential threats to habitat include certain fishing practices, marina construction, navigation projects, dredging, alteration of freshwater input into estuaries, and runoff.

The Gulf of Mexico Fishery Management Council identified and described EFH for all life stages of 26 species within the northern Gulf of Mexico. Table 3-12 presents managed species and their habitat by life stage adjacent to the proposed project area.

Table 3-12. Essential Fish Habitat for Managed Species Adjacent to the Project Area

Species	Life Stage	Habitat
Brown Shrimp	Adult	Soft bottom; estuarine dependent
Cobia	Adult, juveniles/subadults, larvae, eggs[sa]	Pelagic; drifting or stationary floating objects
Dolphin (Mahi)	Adult, juveniles/subadults, larvae, eggs[sa]	Pelagic; floating objects
Greater Amberjack	Adult, juveniles/subadults, larvae, eggs[sa]	Pelagic and epibenthic; reefs and wrecks; to 400 m
Gray Snapper	Adult	All bottom types; 0 to 130 m
King Mackerel	Adult	Pelagic
Lesser Amberjack	Adult, juveniles/subadults, larvae, eggs[sa]	Pelagic
Lane Snapper	Adult, juveniles/subadults, larvae, eggs[sa]	Soft and hard bottom; 0 to 130 m
Little Tunny	Adult, juveniles/subadults, larvae, eggs[sa]	Pelagic
Pink Shrimp	Adult[sa]	Soft, hard bottom; inshore to 65 m
Brown Shrimp	Adults (year-round)	Year-round in water depth >14 m; soft Bottom
Red Drum	Adult[sa]	Soft bottom, oyster reefs, estuarine to 40 m
Stone Crab	Adult[sa]	Soft, hard or vegetated bottom
Spanish Mackerel	Adult, juveniles/subadults, larvae, eggs[sa]	Pelagic; inshore to 200 m
Tilefish	Adult[sa]	Soft bottom, steep slopes; 80 to 540 m
White Shrimp	Adult, juveniles/subadults, larvae, eggs[sa]	Soft bottom; inshore to 40 m

sa = spawning area

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4. ENVIRONMENTAL CONSEQUENCES

4.1 AIR QUALITY

This section discusses the potential impacts to air quality from the Proposed Action and No Action alternative. For the analysis of the Proposed Action, a threshold on an individual pollutant-by-pollutant basis was established.

In order to evaluate the air emissions and their impact to the overall ROI, the emissions associated with the project activities were compared to the total emissions on a pollutant-by-pollutant basis for the ROI's 1999 NEI data. Potential impacts to air quality are identified as the total emissions of any pollutant that equals 10 percent or more of the ROI's emissions for that specific pollutant. The 10 percent criteria approach is used in the General Conformity Rule as an indicator for impact analysis for non-attainment and maintenance areas and although the entire state of Florida is attainment, the General Conformity Rule's impact analysis was utilized to provide a consistent approach to evaluating the impact of construction and aircraft emissions. To provide a more conservative evaluation, the impacts screening in this analysis used a more restrictive criteria than required in the General Conformity Rule. Rather than comparing emissions from construction activities to regional inventories (as required in the General Conformity Rule), emissions were compared to the individual county (Okaloosa) potentially impacted, which is a smaller area.

A DoD developed model, the Air Conformity Applicability Model (ACAM), which the USAF uses for conformity evaluations, was utilized to provide a level of consistency with respect to emissions factors and calculations. Air emissions estimated using the ACAM is compared to the established 10 percent criterion for Okaloosa County as represented in the USEPA 1999 NEI (USEPA, 1999). Emissions associated with construction activities are the main issues the Proposed Action generates and were the focus of the air analysis.

4.1.1 Proposed Action (Repair and Construct Seawalls)

The Proposed Action would not significantly affect air quality. To determine potential effects, seawall repair/construction air emissions were evaluated against each individual pollutant as represented in the 1999 NEI for Okaloosa County. Nitrogen oxides (NO_x) and SO_2 constitute the highest percentage of emissions from the project overall in comparison to the criteria threshold. If the project activities exceeded 10 percent or the annual emissions on a corresponding pollutant-by-pollutant basis, then air quality was impacted. Since, the 10 percent criterion would not be exceeded then significant impacts to air quality would not occur. Table 4-1 provides a tabular representation of the project emissions overall. Appendix A provides more detail on how the analysis was conducted.

Table 4-1. Proposed Action (Construction) Emissions

Emission Source	Pollutant (Tons/yr)				
	NO_x	CO	PM_{10}	VOC	SO_2
Proposed Action	63	43	8	8	5
Okaloosa County	8,787	151,985	16,657	20,186	668
Percent of ROI	***0.7%***	***0.03%***	***0.05%***	***0.04%***	***0.8%***

4.1.2 No Action Alternative

Under the No Action alternative the Air Force would not implement the proposed project activities. Consequently, the environment within and adjacent to the alternative locations would remain as baseline and there would be no impacts associated with air quality beyond the scope of normal conditions and influences at these locations.

4.2 WATER RESOURCES

This section discusses the potential impacts to water resources located at SRI as described in Section 3.2, Water Resources.

4.2.1 Proposed Action (Repair and Construct Seawalls)

Surface Waters

The proposed construction activities would not affect any surface waters (ponds or wetlands) on SRI. Because of storm-induced shoreline erosion, TS A-3, A-11 and A-13 are partially located in the Gulf of Mexico.

Water Quality

The Proposed Action would not have a significant effect on Gulf of Mexico water quality. Only TS A-3, A-11 and A-13 are located in the water. During seawall expansion and repair sediments would be disturbed causing temporary increases in turbidity in surf zone waters. The surf zone is by nature a turbid environment due to the continuous breaking of waves. The effects to turbidity levels caused by construction would be on a much smaller scale than that caused by continuous wave action.

4.2.2 No Action Alternative

Under the No Action alternative the Air Force would not implement the proposed project activities. Consequently, the environment within and adjacent to the alternative locations would remain as baseline and there would be no impacts associated with water quality beyond the scope of normal conditions and influences at these locations.

4.3 SOILS AND SEDIMENT RESOURCES

This section evaluates the potential effects of the Proposed Action, and the No Action alternative to SRI soils.

Activities such as dredging and land mass restoration all require the use of the sand and sediments that lie within one mile of the MHWL. Sands and sediments in this location would be removed by either hopper dredge or pipeline and added to the present coastline and proposed dune construction areas. Since the nearshore bottom topography is a relatively flat, sandy area with no apparent outcrops, the Air Force does not expect this action to dramatically alter bottom topography.

4.3.1 Proposed Action (Repair and Construct Seawalls)

Seawall repair and construction proposed for this project can affect oncoming wave energy and the longshore transport of sand. New construction at TS A-3½, A-6, A-13B and A-18 would not interact with wave energy unless the current shoreline retreats further. It is presumed existing seawalls at TS A-3, A-11 and A-13 are having some effect on longshore transport. However, the evidence of this may have been eradicated given the loss of beachfront due to hurricanes. Shoreline restoration would alleviate the interaction of seawall structures with ocean wave energy by increasing the beach in front of these structures. This combination would result in minimal effects to sediment composition and transport.

4.3.2 No Action Alternative

The No Action alternative would not result in the repair, replacement and extension, and construction of seawalls and bulkheads or restoration of the Island landmass through shoreline restoration and dune construction. Eglin AFB would continue current military mission testing and training using damaged test area infrastructure and an eroded landmass that is unprotected against future storm events. No man-made impacts to soil resources are associated with this alternative since no action would be taken. Natural erosion and loss of beach sand would continue without added shoreline protection and restoration of damaged dune areas.

4.4 FLOODPLAINS

Nearly all of the SRI Range Complex is designated as a SHFA and is in a FEMA designated V-zone for hazards from storm surge. Thus, the project area for the Proposed Action occurs within the SHFA and V-zone.

4.4.1 Proposed Action (Repair and Construct Seawalls)

Construction

Construction activities would not have significant adverse effects to the floodplain, or to structures within the floodplain. Construction would not alter the base elevation of SRI. There

are no habitable structures on the SRI Range Complex. Construction and repair of seawalls and bulkheads would prevent flooding and erosion of Air Force facilities caused by storm surge.

The construction, repair and extension of existing seawalls would provide immediate protection to facilities and roads within the SHFA. Seawall extension and construction would deflect storm surge and redirect flow around existing test site buildings. Proposed new structures including the concrete pad and bulkhead at TS A-3½, the bulkhead at TS A-6, the seawall at TS A-13B, and the bulkhead at TS A-18 would not adversely modify the floodplain.

4.4.2 No Action Alternative

No construction or land mass restoration would occur within the floodplain under this alternative. Routine repairs to maintain the status quo would continue as funds allow. No measures to protect against storm surge would be implemented and facilities would remain at risk for further damage.

4.5 PUBLIC ACCESS

4.5.1 Proposed Action (Repair and Construct Seawalls)

The Proposed Action would not affect public access. The test facilities, seawall and bulkhead locations and proposed concrete pad site are closed to the public. Construction and repair of seawalls and bulkheads would not affect commercial and recreational activities in the Gulf of Mexico.

4.5.2 No Action Alternative

Under the No Action alternative the Air Force would not implement the proposed project activities. Consequently, the environment within and adjacent to the alternative locations would remain as baseline and there would be no impacts associated with public access beyond the scope of normal conditions and influences at these locations.

4.6 SOCIOECONOMICS

4.6.1 Proposed Action (Repair and Construct Seawalls)

The Proposed Action would result in minimal negative and minimal positive socioeconomic effects. No significant effects would occur. Construction would not affect tourism, recreational or commercial fisheries or commercial shipping. All of the sites proposed for construction are Air Force test facilities where public access is prohibited.

4.6.2 No Action Alternative

There would be no change to tourism, commercial or recreational fishing or commercial shipping under the No Action alternative. The public would continue to access Eglin beaches for

recreation without interruption. Without restoration of SRI, the GIWW may continue to receive sand and sediments from hurricanes and tropical storms.

For the Air Force, the No Action alternative would potentially result in economic losses of several million dollars if unprotected facilities experience destructive storm surge. Table 4-2 provides the fiscal year (FY) 2006 replacement value of infrastructure (real property excluding land value) and instrumentation (systems and electronics) at Proposed Action test sites. The 300-foot OA-HITL tower at TS A-13B alone has a value of $12 million dollars. The value of test programs that depend on these facilities is not included in Table 4-3 below. The programs the SRI facilities have supported, and would potentially support in the future, collectively exceed several hundred million dollars.

Table 4-2. FY2006 Replacement Value of Infrastructure and Instrumentation for Proposed Action Facilities

Test Site	Value (dollars)	
	Infrastructure	Instrumentation
A-3	9,019,000	9,465,000
A-6	2,780,000	3,926,000
A-11	9,948,000	10,413,000
A-13	4,638,000	5,121,000
A-13B	21,945,000	1,170,000
A-18	293,000	23,000
Totals	**$48,623,000**	**$30,118,000**
Grand Total	**$78,741,000**	

Source: USAF, 2006a

4.7 HAZARDOUS MATERIALS AND SOLID WASTE

4.7.1 Proposed Action (Repair and Construct Seawalls)

The Proposed Action would require onsite refueling of construction equipment. Petroleum fuels are considered a hazardous material. The Proposed Action has the potential to generate solid waste from repair and construction of seawalls and bulkheads, and accidental releases of petroleum fuels from equipment operations and refueling. Other than leaks and small spills that may occur during routine construction activities, no hazardous waste would be generated.

Hazardous Materials

The Proposed Action would not have significant impacts with regards to hazardous materials usage or spills. The Air Force anticipates construction equipment for the Proposed Action would include a crane, dump trucks, generators and earthmoving equipment. A fuel truck would periodically come to the project site as necessary to fuel the equipment. Petroleum hydrocarbons such as fuel, lubricants, and petroleum based products would be considered hazardous waste if they were released into the environment. Potential impacts are associated with the potential for petroleum, oil, and lubricant (POL) spills to occur and contaminate soils and water resources.

All handling of fuels would be in accordance with applicable federal, state, and Air Force regulations, which include AFI 23-201, Fuels Management. Should a POL spill occur during refueling or project related activities, the presence of spill response equipment would ensure quick response by on-site personnel. The USACE and their contractors would follow management requirements stated in AAC Plan 32-5 and 32-9 as well as applicable federal and state management requirements. The contractor must report any environmental spill to the Spill Response Manager in accordance with AAC Plan 32-5. Within four hours of a spill event on Eglin, a Spill Response Form must be faxed (882-7675) to the compliance branch (96 CEG/CEVCP). 96 CEG/CEVCP would report any spills over 25 gallons to the FDEP. With these management requirements in place, the Air Force does not anticipate significant impacts from hazardous materials and waste associated with the Proposed Action.

Solid Waste

This section discusses potential impacts from solid waste generation, which includes C&D debris from the existing and proposed project areas associated with the alternatives. Analysis focuses on assessing the ability of existing landfill capacity to accommodate increased utilization.

The Proposed Action would generate various types of C&D debris, such as concrete and steel. The contractor can generally reuse concrete as rubble rip-rap for this project or other projects. Table 4-3 summarizes the estimated amount of C&D debris generated from the Proposed Action.

Table 4-3. Estimated C&D Debris Generated by Proposed Action and Percent Increase in Disposal Rates to County Landfills

	Location	Item	Square Feet	Total lbs/ft^2 [a]	Total Tons	% Increase in Landfill Annual Disposal Rates [b]	
						Okaloosa County	Santa Rosa County
Construction Activities	A-3, A-6, A-11, A-13, A-13B	Seawalls	114,750	461,295	230.65	***3.3***	***2.5***
	A-6	Bulkhead	8,400	33,768	16.88		
	A-3½	Concrete Pad	4,885	19,637.7	9.82		
	A-3½	Access Road	2,160	8,683.2	4.34		
				Total Construction Debris	*261.69*		
Demolition Activities	A-3 and A-11	Seawall	27,370	4,735,010	2,367.51		
				Total Demolition Debris	*2,367.51*		
				Total C&D Debris	***2,629.20***		

Source: USEPA, 1998

[a]Calculation based on average C&D debris generated during non-residential construction (4.02 lb/ft^2) and non-residential demolition (173 lb/ft^2).

[b]Based on total C&D debris being disposed of in a single county's landfill. Recycling and equal distribution of debris between county landfills would reduce any potential impacts.

C&D Landfill Capacity

Increases in the amounts of C&D debris to the countywide Class III landfills would not result in the landfills exceeding their capacities. Private companies own and operate most of the Class III

landfills. To gauge the effects of Hurricane Ivan on C&D debris capacity at the local C&D landfills, interviews were conducted with a sampling of the landfills. All of the private owners were confident that while Hurricane Ivan debris did have an effect on the landfill capacity, it did not shorten the lifespan of the landfills and expansion was not an issue (USAF, 2005 and USAF, 2006).

To reduce the amount of C&D debris taken to area landfills, recycling of materials would be required of the contractor. Additionally, coordination with the local county and private landfill operators prior to demolition or construction would aid in equal distribution of debris and reduce any unanticipated impacts associated with the disposal.

The increase to Okaloosa and Santa Rosa County landfills would be minimal, with a total increase of 3.4 and 2.6 percent, respectively (based on all C&D debris being disposed of in only one county). Recycling and equal distribution of debris to county landfills would reduce these disposal rates. The Air Force does not expect the Proposed Action to have a significant impact on county landfills. A slight short-term beneficial impact to local landfill operators may occur from increased revenues during the project.

4.7.2 No Action Alternative

Under the No Action alternative the Air Force would not implement the proposed project activities. Consequently, the environment within and adjacent to the alternative locations would remain as baseline and there would be no impacts associated with hazardous materials or solid waste beyond the scope of normal conditions and influences at these locations.

4.8 CULTURAL RESOURCES

Use of earthmoving equipment for shoreline restoration, dune and seawall construction may potentially affect cultural resources. The Air Force surveys areas potentially affected by mission activities as part of the Air Force Environmental Impact Analysis Process (AFI 72-7061), and mitigative or management measures are developed to minimize any potential impacts. Defining these areas potentially affected aids project planners and managers in decision-making for relocation of a project site to avoid delays necessitated by additional investigation and/or consultation. In accordance with AFI 32-7065 the specific locations of historically significant sites cannot be identified in public documents so that these sites are not impacted by vandalism or theft. This specific information is sensitive and can be acquired from Eglin Cultural Resources (96 CEG/CEVH) as required.

The entire project area has previously been surveyed for cultural resource presence/absence. Due to this survey work the location of cultural resources are well known on SRI. Eglin is currently conducting a cultural resource assessment of both Okaloosa and Santa Rosa Islands to determine the status of previously documented sites after several active hurricane seasons in 2004 and 2005.

4.8.1 Proposed Action (Repair and Construct Seawalls)

Under the Proposed Action, known historic structures at TS A-3, A-11, A-13 would benefit from the construction of bulkheads/seawalls. The Proposed Action would serve to prevent further erosion and damage from storm surge to these historic structures.

4.8.2 No Action Alternative

The No Action alternative would result in no changes to the SRI Complex. The Air Force would not reconstruct dunes, restore the beach, or extend or repair seawalls. As the Air Force would make no effort to protect shorelines and island stability under this alternative, destabilization of SRI would continue, leading to further loss and deterioration of beaches and known existing terrestrial cultural resources.

4.9 NOISE

4.9.1 Proposed Action (Repair and Construct Seawalls)

The Proposed Action would not have significant noise impacts to people or wildlife, including protected species.

The Proposed Action would produce underwater noise and in-air noise almost continuously over a four to five month period. Dredging, land mass restoration and construction all consist of actions that require the use of heavy machinery characterized by mostly diesel driven engine noise. Some types of machinery used in seawall construction, namely pile drivers to install sheet pile, would produce noise that is impulsive in nature. Impulse noise is abrupt and intense as would be the case when steel sections of the seawall are driven downward into the beach by the force of a pile driver. Other methods for installing sheet pile including vibratory hammers and jetting are less noisy. Generally construction noise for the Proposed Action would be stationary and intermittent. Dredging and land mass restoration noise would be transient, but more or less continuous.

Potential noise effects must be considered within the context of the receiver, meaning the animal or person that would be present to actually hear the noise. Proximity (the closeness) of the receiver to the noise source is important when determining whether adverse effects would be likely to occur.

Noise Effects from Construction

Since some of the construction actions occur adjacent to buildings where Air Force and civilian personnel work, there is a risk for potential noise effects to people. Animals, notably shorebirds and wading birds would be exposed to noise but there are no exposure thresholds for determining impacts. Occupational Safety and Health Administration (OSHA) thresholds for occupational noise exposure to people are provided in Table 4-4. Table 4-5 provides noise at a distance for several types of construction equipment required for the construction phase of the Proposed Action.

Table 4-4. OSHA Allowable Noise Exposures

Duration per day (hours)	Sound Level (dBA)
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105

Source: 29 Code of Federal Regulations, 1910.95, Occupational Noise Exposure

Table 4-5. Typical Construction Equipment Noise Levels in A-weighted Decibels

Equipment	Distance From Equipment Sound Source (feet)			
	50	100	200	400
Concrete mixer	82-85	76-79	70-73	64-67
Generators	81	75	69	63
Compressors	83	77	71	65
Loaders, excavators	80-85	74	68	62
Pile Driver	90-105	84-99	78-93	72-87

Source: Suter A., 2002

Noise Effects to People

There is a potential for noise to affect Air Force and civilian personnel working at TS A-3, TS A-6, TS A-13 and TS A-13B. Seawalls are or would be within 200 feet of the facilities at these locations. Air Force and civilian personnel may experience loud noise during seawall repair and construction. TS A-11 is not currently occupied and there are no buildings at TS A-3½. Thus, effects to people at TS A-3½ and TS A-11 would not occur. The cinder block construction of the facilities at the potentially affected locations would dampen some of the noise received by persons working inside them. Potential exposure to unsafe levels of noise, particularly during pile driving of new seawall sections would occur to persons working outside. Table 4-5 provides noise levels for pile drivers, which even at 200 feet can exceed safe exposure levels for an 8-hour exposure. OSHA noise standards state 8-hour noise exposure levels should be less than 90 dBA. A one-hour exposure limit is standard for noise of 105 dBA. Thus Air Force and civilian employees working outside while construction is underway should wear hearing protection as appropriate according to the standards in Table 4-4 and the typical construction noise levels in Table 4-5.

Noise Effects to Animals

Construction noise would temporarily disturb birds and wildlife on the SRI Range Complex. Construction is limited to seven test sites, A-3, A-3½, A-6, A-11, A-13, A-13B and A-18. The noise would center on the efforts to repair, extend or construct seawalls and bulkheads at these test sites, which are already characterized by human disturbance. Because of the temporary nature of the noise, no significant impacts to birds and wildlife near these test sites would occur.

4.9.2 No Action Alternative

The No Action alternative would not result in an increase in noise on the SRI Range Complex. There would be no construction or repair, or land mass restoration actions.

4.10 BIOLOGICAL RESOURCES

This section discusses potential impacts to terrestrial and marine biological resources located on SRI and in the adjacent marine waters. No activities are proposed near *Cladonia* habitats; therefore no analysis for this species is necessary. The main potential issues are noise, lights, direct physical impacts, and habitat alteration. Analyses focus on assessing the potential for impacts to biological resources from construction, repair, shoreline restoration, and dune restoration activities; identifying required consultation; and identifying methods to reduce the potential for negative impacts to biological resources from these activities.

Impact analysis was conducted by first identifying the sensitive habitats and species located within the study area and the proximity of the habitats and species to various impact areas, such as seawall construction areas. Next, analyses were done to estimate the potential for impacts and the extent of impacts in the affected areas. Management requirements to alleviate potential impacts to biological resources from proposed activities are provided at the end of the Biological Resources section.

4.10.1 Proposed Action (Repair and Construct Seawalls)

Effects from Construction

Effects to Nearshore and Surf Zone Organisms from Construction

Effects from seawall and bulkhead construction to nearshore and surf zone species would be minimal. Some loss of infaunal and larger invertebrate species (coquina, ghost crabs) would occur as a result of the placement of the seawall/bulkhead construction and repairs. The effects would be confined to a small area as each seawall would be no more than 1,500 feet long, with the majority of that length (the two 500-foot lateral walls) extending away from the surf zone.

Effects to Protected Species from Construction

Seawall repair and new construction has the potential to affect nesting sea turtles, which are a protected species. No affects would occur to Gulf sturgeon and marine mammals.

Effects to Sea Turtles from Construction

Repair and construction work on seawalls, bulkheads, and a concrete pad would likely affect sea turtles, primarily by increasing the potential for nest destruction, causing ruts on the beach, and decreasing available nesting habitat. No nighttime construction work is planned, so no direct physical impacts to adult or hatchling sea turtles are anticipated.

Equipment use on the beach has the potential to affect sea turtles during sea turtle season. Because no nighttime work is planned and all personnel and equipment would be off of the beach during the night, the primary issues of concern are nest destruction, ruts, and survey interference from daytime beachfront activities. To avoid the potential for these impacts, nesting surveys would be conducted 70 days prior to repair/construction activities or by 1 May, whichever is later. It takes 70 days for loggerhead sea turtle eggs to hatch. If the survey begins 70 days prior to construction, then all nests the initial construction could potentially affect can reasonably be accounted for. Surveys would continue through the end of the project or through 1 September, whichever is earlier. Nests would be checked beyond the completion date of daily early morning surveys to determine hatching and emergence success. No work would begin until after the morning sea turtle survey had been completed and all nests marked and protected in accordance with established 96 CEG/CEVSN and state protocol. 96 CEG/CEVSN biologists would install a series of stakes and highly visible survey ribbon to establish a radius surrounding the nest. No activity would occur within this area. Nests at risk would be relocated.

Examination of historic nesting data shows that six nests have been laid since 1989 within 0.25 mile of TS A-13B, where the new seawall is proposed. Therefore, the new seawall at TS A-13B may affect 0.35 nests per year. At the three sites where seawalls would be repaired and extended, one (A-3), seven (A-11), and five (A-13) nests have been laid since 1989 within 0.25 mile of each respective site. The extension of the seawalls may affect some percentage of these nests, with a maximum potential of 0.76 nests affected per year. However, given that seawalls currently exist at these sites, the number would likely be lower.

The Air Force consulted with the USFWS, which issued a Biological Opinion (BO) on the effects of the Proposed Action on sea turtles. Terms and Conditions for minimizing impacts of the action on sea turtles begin on page 38 of the BO (Appendix G, Attachment G-2). The Air Force will comply with these Terms and Conditions.

Effects to Sea Turtle Habitat from Construction

Seawall repair and construction would result in the loss of sea turtle habitat along a portion of the Eglin SRI beach. The total length of new and repaired seawall would be approximately 8,000 linear feet. Each seawall would be 500 feet in length along the Gulf front with two adjoining walls, also 500 feet in length. The new seawall extensions and additions would increase seawall armament on Eglin's property from 1.5 percent to 7.5 percent of available nesting habitat. Sea turtles would be deterred from nesting in these seawall areas. USFWS Terms and Conditions for habitat protection and restoration are found on page 41 of the BO (Appendix G, Attachment G-2).

Effects to the Santa Rosa Beach Mouse from Construction

It is unlikely that repair/construction activities on SRI would have impacts on the Santa Rosa beach mouse. They are primarily nocturnal creatures and all work would occur during daylight hours. The construction sites would be within previously disturbed areas and no construction or repair activities would take place within the established dune system. Additionally, Hurricanes Ivan, Dennis and Katrina severely impacted dune systems in these areas so there is little suitable

habitat near the sites. Therefore, there would be no significant effects to the Santa Rosa beach mouse or its habitat.

Effects to Piping Plovers and Critical Habitat from Construction

There is a potential to disturb piping plovers during their winter foraging period, which is from mid-July to mid-May. The Air Force does not anticipate any significant impacts. Critical habitat is located within 100 yards of TS A-18. No direct physical impacts to critical habitat are would occur but the construction at TS A-18 would be close enough to piping plover critical habitat such that this species may be disturbed by noise and motion from vehicles, machinery and human presence. Piping plovers have only been documented to use critical habitat areas on the north shore of SRI. Thus, none of the other seawall/bulkhead construction sites have any real potential to affect this species.

Research indicates that patterns of piping plover habitat usage can be very complex, and plovers could feasibly use several locations on the island for foraging, roosting, or sheltering at any time, day or night. Therefore, if the Proposed Action takes place during the piping plover winter foraging period, it is possible that piping plovers may be present in the action area and impacts could occur. It is possible, though highly unlikely, that construction/repair work could cause direct physical impact to an individual plover if the bird attempted to land on a work site. It is more likely that construction activities would serve to flush the bird from the area, possibly causing stress and extra caloric expenditure. The disturbance generated by repair operations would be sufficient to keep piping plovers from foraging in the work area during the course of the operation. During this time, displaced plovers may simply move on to undisturbed foraging areas. Displacement would be temporary and localized.

Because the risk of direct physical impact to piping plovers is slight and indirect disturbance would be temporary and localized in nature, construction/repair activities on SRI are not likely to significantly affect the winter foraging piping plover population. Impacts to piping plover critical habitat would not occur.

Effects to Shorebirds from Construction

Construction and repair work near TS A-3 and A-3½ may directly impact shorebird nests and may temporarily displace some nesting birds as a result of noise from equipment and personnel during repair/construction activities. Nesting areas are usually found along the rack line or other suitable habitat along the beach and have the potential to occur within these construction areas. Land-based activities near shorebird nesting areas may result in a flush/startle response. During nesting season, this may result in increased vulnerability of eggs and chicks to predation. However, foraging species would typically move on to other areas, while nesting species would return after the general disturbance was over. These activities would also likely scare other species such as predators (e.g., feral cats, coyotes, etc.) from the area, thus reducing the chances of nest predation should nesting birds be flushed.

To minimize the potential for impacts to shorebirds, the 96 CEG/CEVSN would conduct a pre-work survey for nesting shorebirds. If colonies of nesting birds were located at these sites,

work would be delayed until nesting was complete. With this avoidance and minimization measure in place, the Proposed Action would have no significant impacts on shorebirds or their nesting areas.

4.10.2 No Action Alternative

Under the No Action alternative, no seawall construction, repair or extension, dune restoration, dredging, or shoreline restoration would occur. Repairs would still potentially occur periodically, but the Air Force would analyze these actions as needed. Because there was such extensive damage to the beach and dune system at SRI, the option to not conduct shoreline restoration and dune restoration activities may have long-term negative effects on certain sensitive beach species, such as the Santa Rosa beach mouse and sea turtles coming ashore to nest. Hurricanes and tropical storms have reduced the available area for sea turtle nesting.

The No Action alternative would have no immediate or direct effect to surf zone, nearshore or upland beach organisms. The SRI Range Complex would be allowed to continue on its present course of natural, storm-induced erosion. The lack of dunes provides little resistance to overwash from tropical storms, allowing beach sediments to be transported north into Santa Rosa Sound and Choctawhatchee Bay. Litaker and Tester in Valette-Silver and Scavia (2003) state that storm surges can deposit large amounts of sand into inland marsh and estuarine habitats, resulting in significant habitat destruction. In Choctawhatchee Bay, sandy areas support seagrasses, important habitat for many fish and invertebrate species. Several areas of sediment overwash are visible in aerial photos of the SRI Range Complex (see Chapter 2). Thus, indirectly, the No Action alternative will allow for further sand deposition into sound and bay habitats. Changes in habitat from storm-surge transported sediments would affect Estuarine organisms in Santa Rosa Sound and Choctawhatchee Bay.

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5. CUMULATIVE IMPACTS AND IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

5.1 CUMULATIVE IMPACTS

According to Council on Environmental Quality regulations, cumulative impact analysis in an environmental assessment should consider the potential environmental impacts resulting from "the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions" (40 CFR 1508.7) (CFR, 1978).

Definition of Cumulative Effects

Cumulative effects may occur when there is a relationship between a Proposed Action and other actions expected to occur in a similar location or during a similar time period. This relationship may or may not be obvious. Actions overlapping with or in close proximity to the Proposed Action can reasonably be expected to have more potential for cumulative effects on "shared resources" than actions that may be geographically separated. Similarly, actions that coincide would tend to offer a higher potential for cumulative effects.

Past and Present Actions Relevant to the Proposed Action and Alternative

Amphibious Ready Group/Marine Expeditionary Unit (ARG/MEU) Training

In 2003, the U.S. Marines and U.S. Navy began conducting amphibious readiness group training on Eglin. Certain areas on the SRI Range Complex were used for amphibious vehicle access and transition points. Some facilities were used as objectives. An amphibious vehicle cross-over location was established west of TS A-13B.

SRI Range Complex Road Repair

In a separate but related action, the Air Force is repairing the damage to roads and culverts on the SRI Range Complex. Storm surge from hurricanes have caused numerous washouts and in some places completely eradicated this road, which runs the length of the SRI Range Complex. Road and culvert repair consists of reconstructing 3.1 miles of full roadway width (22 feet) and 3.5 miles of half-roadway (11 feet). The Air Force will remove the damaged sections of road, and will place the new road as close to the old alignment as possible. Twelve pre-cast box culverts, totaling over 200 linear feet, will be added in areas that have seen reoccurring drainage and erosion problems. At each box culvert, sheet piling will be added for further erosion protection. The roadway pavement design includes reinforced concrete for 400 feet at each of these box culverts to add further protection against future erosion. The pavement adjacent to the box culverts also has reinforced concrete beams at the edge of the roadway to prevent erosion under the road. The typical pavement section in the areas other than the box culverts is 6 inches asphalt over 12 inches of compacted base. The road shoulders have been protected to prevent scouring under the roadway. The design includes interlocking 8 inch reticulated blocks 6 feet wide on either side of the roadway. Filter fabric will be placed under the blocks and under the

roadway edge to prevent areas susceptible to water penetration. The Air Force will obtain a dredge and fill permit from the FDEP and the USACE for the box culverts.

Adjacent Dredging and Land Mass Restoration Projects

Shoreline restoration is occurring in adjacent or nearby counties. The USACE is restoring 17 miles of beach in Bay County, and lesser amounts in Destin (Okaloosa County), and Walton and Escambia counties. Sand is being obtained from offshore locations with a hopper dredge and pumped onto the beach, or in the case of the Destin and Walton County restoration, from a sand shoal off of East Pass. Bulldozers then move the sand to the appropriate location.

The USACE is dredging East Pass, the channel which borders SRI Air Force property on the easternmost end. Hurricanes and tropical storms have moved substantial amounts of sediment into the channel, creating shallow areas that pose navigation hazards to vessels.

Reasonably Foreseeable Future Actions

Base Realignment and Closure (BRAC)

Under the initial BRAC announcement of May 2005, Eglin AFB would lose 28 military and 42 civilians and gain 2,168 military and 120 civilians for a total gain of 2,140 military and 78 civilians. One action that may be relevant to the Proposed Action is the relocation of the 7th Special Forces Group from Fort Bragg, N.C., to Eglin AFB.

The 7th Special Forces Group would be relocated from Fort Bragg to Eglin to enhance military value and training capabilities by locating special operations forces in locations that best support joint specialized training needs. Many special operations groups use SRI for training. As a special operations force, the 7th Special Forces Group would potentially use beaches and facilities on the SRI Range Complex. No details have been provided to date. No cumulative analysis is currently possible for this action.

Land Mass Restoration

Land mass restoration would include shoreline restoration of the entire 17 miles of SRI beachfront and dune reconstruction at 23 locations of the SRI Range Complex. Widening the beach through shoreline restoration would provide protection from storm surge and wave action because the sand would buffer and protect the structures behind the beach. Dunes act as natural seawalls protecting facilities and infrastructure located behind them by channeling and dissipating storm energy around the dune. The USACE would dredge the sand needed for land mass restoration from the Gulf of Mexico. Probable sand sites are located offshore of the SRI Range Complex within one mile from shore. For the purposes of analysis, land mass restoration consists of three major actions: dredging, shoreline restoration and dune construction.

Dredging

Dredging is the digging up of sand or minerals from under the water. A dredge is a machine that hydraulically suctions or mechanically scoops sediment from the seafloor (USACE, 2002). It

can be mounted on land or on a barge. Land mass restoration would require the use of one of two types of hydraulic dredges, a hopper dredge or pipeline dredge, which work by sucking a mixture of sediment and water from the seafloor. A hopper dredge sucks dredged material from a pipe and pumps the material into a holding bin or hopper. When the hopper is full the vessel travels to the deposit location and pumps the dredged sand through a pipe onto the shoreline restoration site (USACE, 2002). A hopper dredge would make approximately four collection and deposition cycles per day. A pipeline dredge sucks dredged material through a pipe and discharges it directly to the deposit site. The USACE could use either method to dredge and supply sand to the SRI Range Complex. The USACE would deposit the sand on the beach and then distribute it to either shoreline or dune restoration areas. Dredging by either method would occur 24 hours a day for seven days a week. The USACE would complete dredging operations within 4 to 5 months at this rate.

The USACE would obtain sand for shoreline restoration and dune reconstruction from two to four locations directly offshore of the SRI Range Complex. The potential sand sources would be located in Gulf waters between a range of 25-feet water depth out to one mile offshore. The sand selected would be the appropriate particle size and color to closely match the beach sands on SRI. The USACE would conduct a sand source analysis prior to dredging. Magnetometer instrumentation, used to identify metallic items, and sediment core sampling would be performed as part of the sand source analysis. The USACE would use the magnetometer to identify and avoid locations that contained metal, such as shipwrecks, inert ordnance or other mission debris, or would potentially interfere with buried utilities. Sediment cores yield physical samples of the seafloor and allow for visual comparison of the potential sand source characteristics.

Shoreline restoration and dune restoration would require approximately four million cubic yards of sand dredged from the Gulf of Mexico. The USACE would dredge approximately 3.2 million cubic yards of sand to replace beach sand along the shoreline and utilize 800,000 cubic yards of the dredged sand for dune construction.

Shoreline Restoration

Shoreline restoration priority areas are locations 5 miles around TS A-13B and A-13 (2 miles west of A-13B to 2 miles east of A-13), and 4 miles centered around TS A-3. Thus, the minimum length of shoreline proposed for restoration is 9 miles. The restoration process would extend the beach to pre-Hurricane Ivan conditions, or about 150 feet southward.

The Air Force would direct the USACE to dredge sand from offshore of the SRI Range Complex and deliver it to the beach face. The USACE would pump a mixture of water and sand onto shore through a 36-inch pipe. The water would drain directly back into the Gulf or down through the sand and seep into the Gulf. The USACE would use two to four bulldozers, working around the clock to move the sand in place and build out the beach area an additional 150 feet seaward. The process is shown in Figures 5-1 and 5-2; photographs of a similar operation underway in nearby Panama City Beach. Shoreline restoration would take approximately four to five months of continuous operation to complete. As mentioned above, the USACE would ensure the offshore sand matches the color and particle size range of the beach sand. Shoreline restoration would require 3.2 million cubic yards of sand.

Figure 5-1. Dredged Material Being Delivered to Beach Area (Photo Credit: USACE)

Figure 5-2. Bulldozers Working to Restore the Shoreline in Panama City Beach (Photo Credit: USACE)

Dune Restoration

Dune restoration would require 800,000 cubic yards of sand. Bulldozers would push dredged sand from the beach face to the proposed dune locations. Figures 5-3 through 5-7 illustrate locations for dune restoration. The 23 dunes vary in length from 300 feet to 2,700 feet. All total,

Figure 5-3. Aerial View. Reasonably Foreseeable Future Actions (view 1)

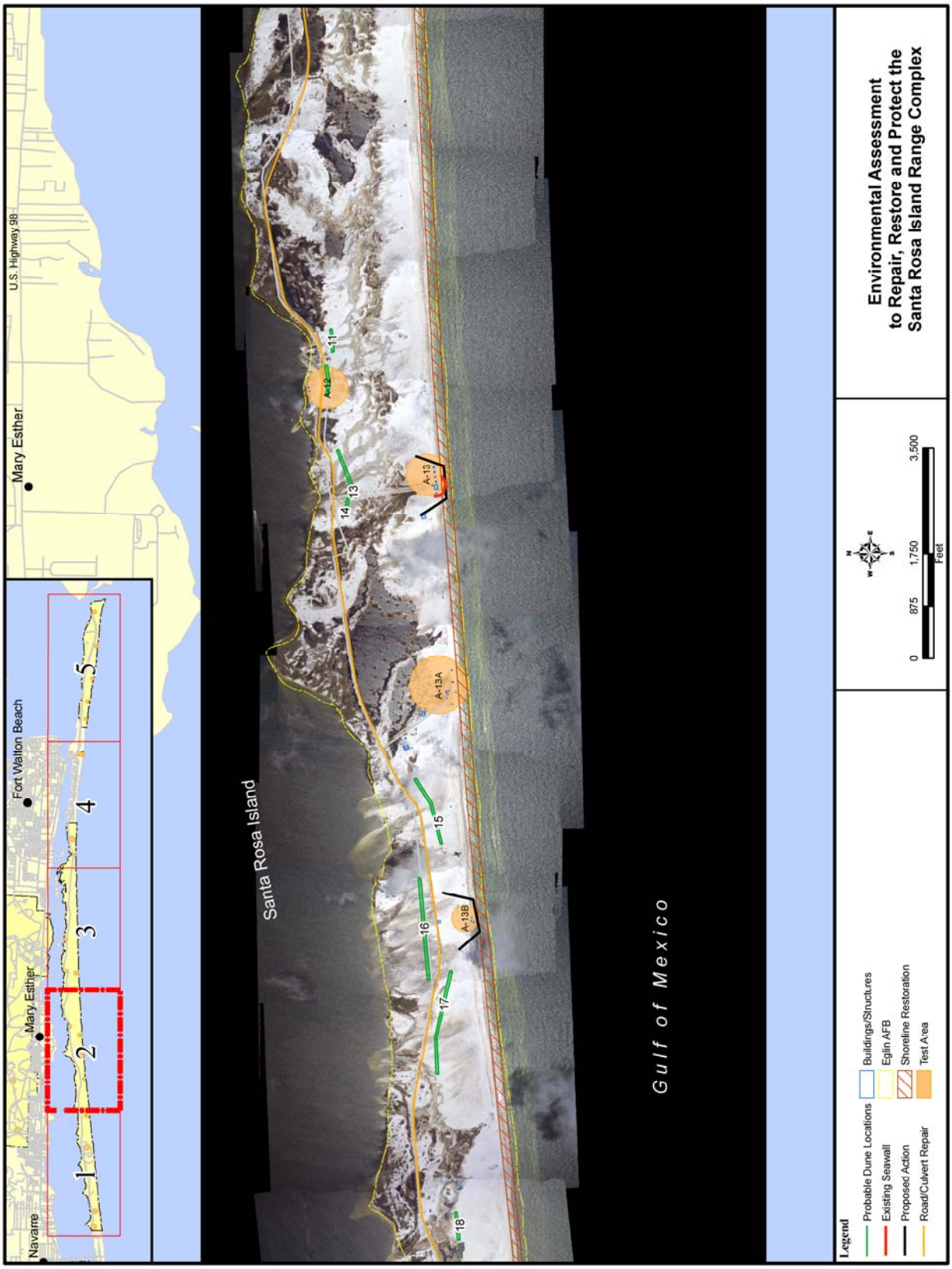

Figure 5-4. Aerial View. Reasonably Foreseeable Future Actions (view 2)

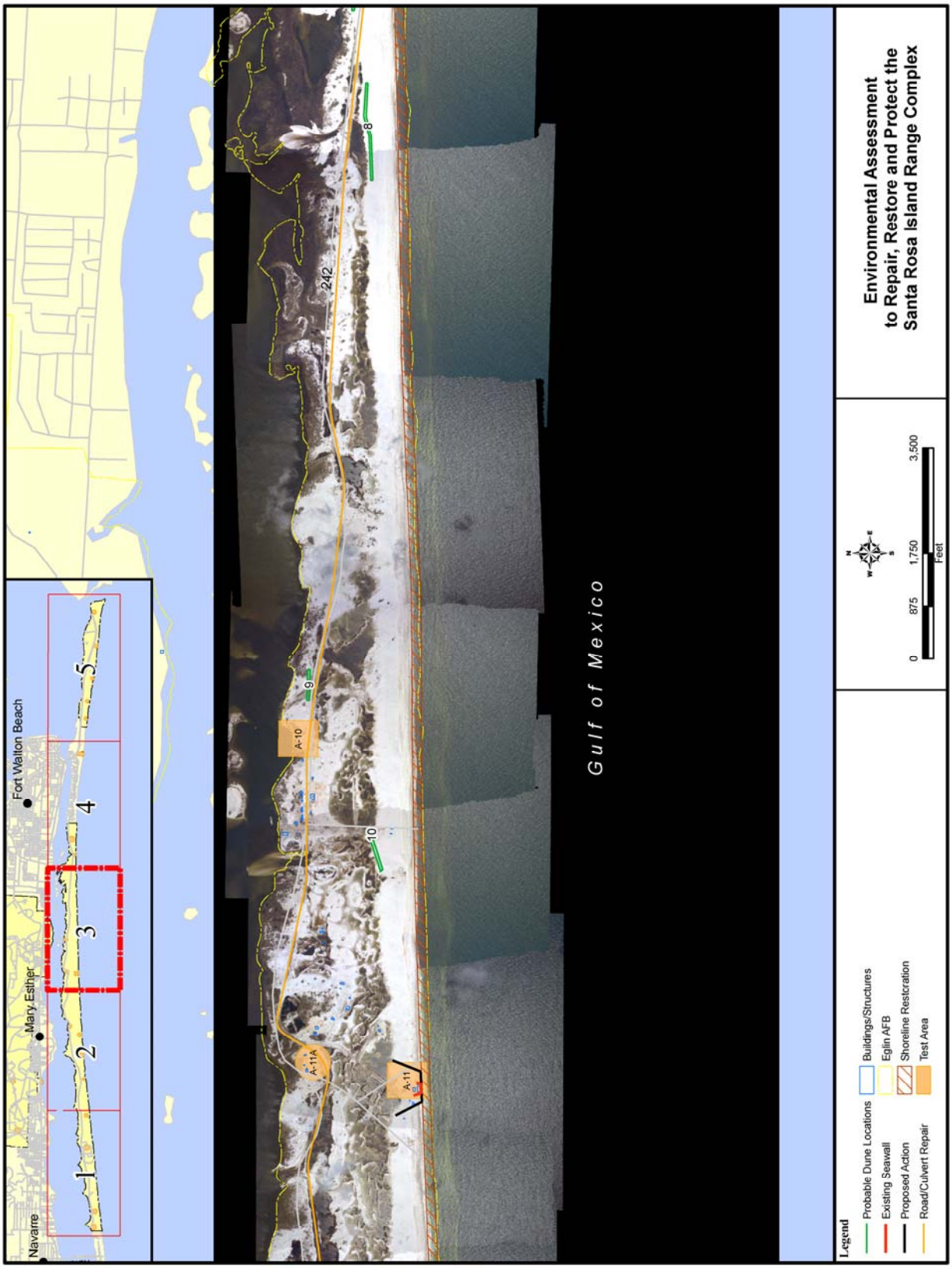

Figure 5-5. Aerial View. Reasonably Foreseeable Future Actions (view 3)

Figure 5-6. Aerial View. Reasonably Foreseeable Future Actions (view 4)

Figure 5-7. Aerial View. Reasonably Foreseeable Future Actions (view 5)

restoration would result in approximately 34,000 linear feet of dunes restored. The base concept, illustrated below in Figure 5-8, consists of a dune structure that is 10 feet high with a 10-foot wide plateau (top) and a 70-foot wide base. Within this base concept the Air Force would construct dunes either in a single line or an alternating, more segmented fashion along the length of the specified location. Placement of sand fencing and vegetation would be on either side of the dune. The total amount of sand fencing would be 60,000 feet. Sand fencing would serve as a barrier to wind blown sand to help it accumulate at the base of the constructed dunes. Coconut mat, a biodegradable fabric, would cover the dune to protect it from wind erosion until planted vegetation matures to provide some stability to the dune. The mat is expected to last approximately three years, after which time vegetation should be established. There would be no vegetation planted directly on the dune, but at the base where growing conditions are optimal. The total number of plantings would be about 100,000.

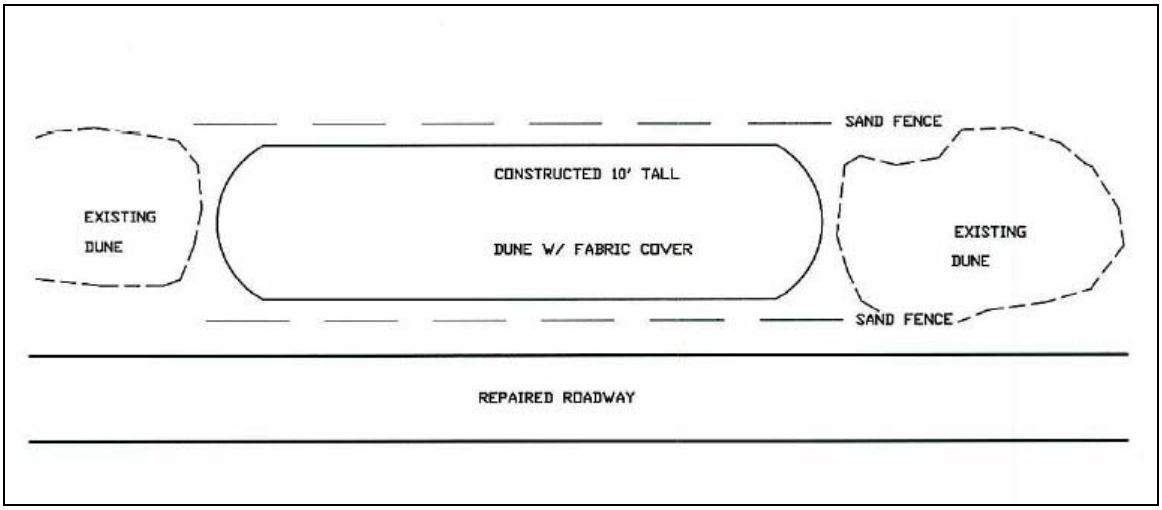

Figure 5-8. Base Concept for Proposed Dune Reconstruction

Relocate Buildings Northward/Rebuild Facilities on Pilings from Gulf of Mexico Shoreline

A reasonably foreseeable action is the relocation northward and/or placement on pilings of Santa Rosa Island facilities. The demolishing and rebuilding of facilities is not currently funded and could reasonably take 20 years to complete. This action is similar to the preferred alternative identified in the *Final Environmental Assessment Santa Rosa Island Reconstitution of Test Capabilities* (USAF, 1998), which proposed that certain SRI test actions be consolidated into three focus sites (A-1, A11 and A-13/14) and the OA-HITL tower be constructed. The facilities at the three focus sites would be established away from the water and elevated on pilings, though no relocation has occurred to date. This environmental assessment demonstrates the desire of the Air Force to move test facilities further north than the current facilities in order to move them farther away from the current shoreline and the effects of shoreline erosion. In the event funding allows the relocation/rebuild action to be implemented, the current facilities would require seawall reinforcement and/or shoreline restoration and in order to maintain uninterrupted test support capabilities. Relocation would require demolition and disposal of the current facilities once the new facilities were completed. Foreseeable environmental impacts of new construction and demolition include generation of debris, construction noise, effects to cultural resources and short-term negative/long-term positive effects to biological resources from the replaced facilities.

5.1.1 Analysis of Cumulative Impacts

Air Quality

Cumulative effects to air quality are not anticipated for the Proposed Action and other relevant past and present actions. There would be emissions from road repair including dust and combustive emissions, and from rebuilding/relocation of facilities occurring over a period of several years. The total emissions from the Proposed Action as well as the past and present relative actions would not exceed the 10 percent criteria threshold established for significant impacts. Future land mass restoration activities would generate air emissions and have been analyzed as follows.

Land Mass Restoration

NO_x and SO_2 constitute the majority of land mass restoration emissions. Air emissions were evaluated against each individual pollutant as represented in the 1999 NEI for Okaloosa County. Emissions from project activities exceeding annual emissions on a corresponding pollutant-by-pollutant basis constitute adverse impacts to air quality. Analysis shows that emissions from land mass restoration would not result in an exceedence of the 10 percent criterion; it is assumed that significant impacts to air quality will not occur. Table 5-1 provides a tabular representation of land mass restoration emissions. Appendix A explains how the analysis was conducted.

Table 5-1. Land Mass Restoration Emissions

Emission Source	**Pollutant (Tons/yr)**				
	NO_x	CO	PM_{10}	VOC	SO_2
SRI Land Mass Restoration	238	115	21	23	17
Okaloosa County	8,787	151,985	16,657	20,186	668
Percent of ROI	*2.7%*	*0.08%*	*0.13%*	*0.11%*	*2.5%*

Impacts to Water Resources

The Air Force did not identify any significant impacts to surface waters from implementation of the Proposed Action. Road repairs have a potential to affect surface waters, especially in areas where culverts would be installed or repaired. No long-term significant adverse effects would occur, and positive benefits to surface waters from road and culvert repair would eventually be realized. Storm surge has destroyed roads, carrying road debris into adjacent waters. The repairs and improvements will fortify roads and culverts to better withstand storm surge.

Potential cumulative impacts to water quality could result from increases in turbidity from adjacent shoreline restoration projects. USACE would conduct all adjacent shoreline restoration projects, and would conduct Proposed Action construction. Although an increase in turbidity is expected for seawall construction and repair, and land mass restoration actions, this increase would be temporary as discussed in the following paragraph. Additionally, USACE would ensure that state of Florida water quality standards are not exceeded. Therefore, the Air Force does not expect significant cumulative impacts to water quality.

Land mass restoration would temporarily decrease water quality but the impacts would not be significant. Changes in water quality from dredging can depend on a number of factors including the type of dredging system employed, characteristics of the sediment, and site-specific conditions. The use of a pipeline dredge instead of a hopper dredge would reduce turbidity plumes during operations. Large turbidity plumes are often associated with hopper dredges when hoppers are filled to capacity and sediment-enriched water spills over them during transport. Additionally, the typical placement of screens at the point of discharge from the hopper dredge can lead to overspill of sediment creating turbidity plumes. Dredging without the use of a screening device would likely diminish the size and duration of turbidity plumes (ASMFC, 2002).

Turbidity within Gulf waters during project activities can result from re-suspension of sediment at the discharge pipe, and from sediment traveling from the shoreline into the surf zone. Waves and currents would transport and disperse these sediments in the long shore direction or seaward. Turbidity can also occur between the mine site and target beach when sand may be lost during hopper loading; leaks may occur in transport pipes, during sediment movement between sites, and from routine drainage of water containing high quantities of fine sediment. Turbidity in the area of the outfall usually disappears within several hours after restoration operations cease. Approximately 97-99 percent of sediment discharged from pipelines settles to the bottom within several tens of meters from the discharge point (ASMFC, 2002).

The Florida standard for coastal water turbidity is 29 NTUs (ASMFC, 2002). USACE would not exceed state of Florida water quality standards for turbidity during the land mass restoration. Additionally, elevated turbidity is typically limited to the period of dredging activity and water quality is typically restored once dredging activities cease (ASMFC, 2002). Therefore, although an increase in turbidity during project activities would occur, this would be a minimal, temporary impact to water quality. Land mass restoration would not have significant adverse turbidity effects to water quality.

Land mass restoration has the potential to allow petroleum hydrocarbons (i.e., oils, fuels) to enter into Gulf waters through leaks or accidents. However, the amount of petroleum products that these activities may release into Gulf waters would be very small in comparison to other activities within the Gulf. Fuel tank ruptures or groundings of a vessel are unlikely. Small leaks of a few gallons pose a more typical risk. By comparison, an estimated 13.6 thousand metric tons of petroleum hydrocarbons enter the Gulf each day from urban runoff alone (USAF, 2003). The amount of petroleum hydrocarbons that project related activities may release into the Gulf would be insignificant. Therefore, the Air Force does not anticipate significant cumulative impacts to water quality from hazardous materials.

Impacts to Soil and Sediment Resources

Terrestrial Soils

Effects from Road and Culvert Repairs

There would be no significant cumulative impacts to soil from road and culvert repairs. This action would occur in an area where soils have been previously modified during the initial

building of the road, and the numerous repairs that have occurred within the last 10 years. The Air Force anticipates a minimum amount of new disturbance to soils and does not expect any significant cumulative impacts.

For land mass restoration, the USACE would implement measures to alleviate compaction following restoration activities. Estimates of soil resource cumulative impact potentials are based on the absence of storm overwash and wave action events that could naturally mitigate adverse soil impacts. The methodology used to conduct this analysis is described in the following subsection.

SRI current and future land uses, as this assessment addresses, include land mass restoration (dredging, dune and shoreline restoration), military mission activities and natural and cultural resource management and public use. Military mission activity occurs across the length of Eglin-owned property, while public use occurs only on county-owned property, the limited-access portion of the Island east of Fort Walton Beach, and within the waters of the Gulf of Mexico, Santa Rosa Sound, and Choctawhatchee Bay.

The subsections that follow assess the anticipated soil impacts of these activities and the potential cumulative impacts of these activities in combination with the Proposed Action. The No Action alternative is excluded from this analysis since it does not introduce new activities.

Based on the review of current and future project activities, potential soil disturbances affiliated with land mass restoration, amphibious assault military activities (for example the ARG/MEU) and public beach recreation (referred to collectively as primary activities) when combined with the Proposed Action are the mostly likely cumulative impact candidates. Amphibious assault mission activities that involve Amphibious Assault Vehicle (AAV) tracked vehicles would cause soil compaction and rutting.

Effects from Shoreline and Dune Restoration

Land mass restoration has the potential to affect natural sediment transport processes. Sand placed for the purpose of shoreline restoration is reworked into the offshore zone by wave action until an equilibrium is reached (URS, 2004). For this reason, a sufficient amount of sand would be deposited to build out the beach and account for loss to equilibrium. The USACE would conduct a sediment transport analysis prior to the initiation of any dredging and shoreline restoration to determine how much sand to place. Therefore, dredging and shoreline restoration would not significantly affect the longshore transport of offshore sediment. The long-term effects may be beneficial as more sand is made available for natural beach building processes.

Land mass restoration would have potentially adverse effects to terrestrial soils, and possible beneficial impacts to longshore transport of sediments. Beneficial impacts may result from the build out of beach area in front of existing seawall structures. Because these structures currently exist at the waters edge and interact with waves, changes to how sediment is naturally delivered to the coastline can result. Building out the beach in front of these structures can eliminate the contact structures have with wave energy, and the effect these structures have on longshore transport.

Approximately 17 percent (604 acres) of SRI is susceptible to soil compaction from land mass restoration activities. This estimate is based on a beach building zone 150 feet wide and 17 miles long and a high impact 100 foot buffer area around each of the 23 dune building sites. Soil trafficking impacts from bulldozing operations during shoreline restoration will probably be somewhat evenly distributed over the entire project area. For sand dune construction it is estimated that the 50- to 100-foot zone around the slope toe perimeter of each constructed dune will likely exhibit the highest degree of soil compaction from bulldozing.

The most severe soil compaction would likely occur under wet soil conditions when water tables are less than 2 feet below the surface and following rainfall events when the near surface soils are wet. Since landmass reconstruction will be continuous for several months, soil trafficking during wet periods is inevitable. Use of dredged sediments with increased levels of silt and clay compared to existing soils could also increase soil compaction potentials. However, the USACE would conduct a compatibility analysis prior to any activity to ensure that this does not occur.

Soil compaction could be severe in the absence of long-term intervention. Compacted soils would likely exhibit subsurface anaerobic (no or low oxygen) conditions and restricted soil respiration rates (Scheerer et al., 1994; Liddle and Greig-Smith, 1975), alter water table hydraulic gradients and flow (Sun et al., 2001), and restricted plant establishment and growth (Busscher et al., 1995; Unger and Kaspar, 1994; Liddle and Greig-Smith, 1975a). The Air Force would implement soil recovery intervention to alleviate soil compaction damage.

Intervention would entail the physical amendment of compacted soils to predisturbance conditions. Based on the depth and extent of compaction, USACE would use tillage implements or hand tools to restore natural soil conditions. To prevent additional damage, the Air Force would conduct soil recovery operations as soon after construction as possible and prior to vegetative plantings. Following tillage and field validation of compacted soil mitigation, USACE would dress the treated areas with lighter weight tractors. Some dune areas may need to be dressed with hand tools. The Air Force would not conduct soil recovery operations during wet periods.

Effects from ARG/MEU Training

Amphibious AAV vehicles can damage SRI soil resources. In most cases, soil damage would be localized to the military vehicle footprints. Impacts would primarily occur along the beach and at cross-over points. Potential cumulative soil resource impacts would be most evident in the recompaction of soil areas where compaction created by construction (Proposed Action) was alleviated by prescribed soil recovery mitigation measures (Chapter 6). Amphibious assault missions and the Proposed Action are not anticipated to occur at the same time.

The artificial distribution of sediments by land mass restoration could create a matrix of sand grains that is more vulnerable to damage from mechanical compression when compared to a coastal soil profile created by natural storm overwash or wind aggregation/degradation erosion processes. Management practices identified in Chapter 6 would prevent cumulative effects from occurring. Baseline field surveys, vector footprint analysis and modeling, and monitoring would be required to quantify cumulative impact potentials.

Altered hydrology impacts would most likely occur with 30 m of the waters edge and be relatively short term because of the dynamics of wave action and beach erosion. Areas that exhibit minor to moderate levels of compaction may actually benefit from increased soil moisture content. Increased amounts of water within the root zone could promote the germination and growth of planted vegetation especially during dry periods. Soil management practices would also remove subsurface compacted layers that otherwise could restrict vertical and horizontal soil water movements which could result in the formation of new wetland areas. There would be no significant cumulative effects on hydrology.

Since soil management practices would promote the natural movements of water, minerals, and nutrients within the soil profile, the combined cumulative effects of amphibious vehicles and the Proposed Action on soil productivity would not be significant.

Impacts to Marine Sediments

Effects from ARG/MEU Training

Cumulative impacts to marine sediments would not be significant. ARG/MEU activities do not involve the removal and relocation of marine sediments, and only disturb marine sediments at the waters edge as vehicles are transitioning onto land. No cumulative effects with regards to longshore transport would result from amphibious assault activities and the Proposed Action. Adjacent dredging and beach restoration projects may have cumulative impacts with regards to longshore transport of sediments. A regional (adjacent counties) analysis of sediment dredge sites would be required to determine whether adverse cumulative effects would occur.

Effects from Dredging

Dredging would not have a significant cumulative effect on bottom topography and sediment transport processes. Because sediment composition within the Gulf varies geographically, the USACE would target specific areas for dredging that have similar sediment characteristics as the SRI beaches, therefore dredging would not affect sediment composition. Other than effects to bottom topography from removal, the Air Force does not anticipate any negative effects to sediments. Dredging would not affect the geology and removal would occur over a small area compared to the total available offshore area. Hopper dredges would likely cause the least amount of change to bottom topography since the sediment removal method is shallow compared to the pipeline dredge. Therefore, pitting, rutting and compaction are less likely to occur with the hopper dredge. Some floating or buried pipeline may be used with either the hopper or pipeline dredge, though more would be used with the pipeline dredge. Pipelines that are installed on the sea floor would potentially have more effects, such as compaction. The length of pipe depends on the exact dredge location, which is unknown at this time.

Impacts to Wetlands

Cumulative impacts to wetlands would not occur. Based on the ARG/MEU Training EA, wetlands will not be disturbed during the exercise activities. There are no wetlands near proposed seawall construction sites for the Proposed Action. Activities associated with land

mass restoration will not affect wetlands located on SRI. Wetland location data for future dune restoration locations was compiled using a combination of Eglin and National Wetlands Inventory sources as well as a physical inspection of the possible sites. National Wetlands Inventory wetland maps were found to be inaccurate for many locations on SRI due to the changes wrought by hurricanes. Many wetland areas have been inundated with sand and new areas have been created. During the physical inspection, a 50-foot working buffer was factored into whether wetlands would be disturbed during the land mass restoration activities.

A site visit was made to SRI and each potential sand dune construction site was found using Global Positioning System coordinates and physically inspected to determine the proximity to wetlands. Based on this site inspection, the Air Force does not expect land mass restoration to have any adverse impacts to wetlands. As an added precaution during dune construction, a wetland biologist would be onsite to ensure that bulldozer crews do not accidentally operate within wetlands.

Culvert installation would potentially affect wetland areas. The Air Force will obtain a dredge and fill permit from the FDEP and USACE for this action. No significant cumulative impacts are anticipated and long-term benefits to the wetland areas would be realized from this action.

Impacts to Floodplains

Land mass restoration would not have significant cumulative impacts to the floodplain. Dune restoration and shoreline restoration would have beneficial effects to structures within the floodplain by increasing the base elevation and renewing some of the barrier functions of SRI. Hurricanes and tropical storms have leveled many areas of SRI that once had elevations of 20 feet or more. This reduction in base elevation has effectively lowered the floodplain, making SRI more susceptible to storm surge and overwash. Relocating and rebuilding facilities on pilings would be a beneficial change with respect to impacts in the floodplain. Land mass restoration would restore elevation and protect roads and facilities on the SRI Range Complex, reducing the destructive effects of storm surge.

Impacts to Public Access

Cumulative public access impacts would occur if increased closures to public areas resulted in negative impacts to the public or the local tourism and commercial fishing industries. The Proposed Action would not affect public access, and thus has no potential for cumulative impacts with other past or present actions. Although ARG/MEU, and adjacent shoreline restoration projects would result in some restricted access to the public from beach closures and use of offshore areas in the Gulf, these closures would be small-scale, temporary, and only in areas immediately surrounding activities associated with the projects. Additionally, available environmental analyses have not identified any negative impacts resulting from temporarily limiting public access. Rebuilding and relocating facilities and road repairs would not have effects on public access. Thus, the combined impacts of the Proposed Action with other past, present or futures activities to tourism, commercial and recreational fishing, and public access would not be significant. Additional discussion is provided on future land mass restoration.

Future land mass restoration would not have significant public access impacts. Public access impacts would be associated with dredging, dune restoration, and shoreline restoration activities at SRI. Persons that restricted access would potentially impact include the military and the public desiring to use recreational shoreline areas and recreational and commercial boaters. Activities associated with this alternative would occur primarily on Eglin owned portions of SRI that are not open to the public. People would be restricted from accessing Eglin beaches for a few days, while an area (or 2 to 4 smaller areas) totaling 1,500 acres offshore would be off-limits to fishermen and boaters for a period of four to five months. The public would be temporarily restricted from Eglin beaches on the eastern section of SRI that currently allow public access.

Recreation

Land mass restoration would require the temporary closure of recreational areas on the 4-mile eastern section of SRI. Approximately 0.14 mile of beach would undergo project activities per 24-hour period during the project. This equates to approximately 3.4 percent of the available beaches on this eastern section of SRI. Parallel parking is possible along the 4-mile stretch of Hwy 98 and pedestrian beachgoers can access the beach at designated access points along this stretch. Posting signs at public access points advising beachgoers of potential restriction of beach access during time of project related activities would provide a public safety measure. Although the proposed project would require a small portion of the eastern section of SRI to be restricted to the public each day over the time period of the project, these impacts would be minimal and temporary. Therefore, the Air Force does not expect significant adverse impacts to public access, including impacts to the tourism industry.

Boating, Shipping, Fishing

Project related activities may impact vessel traffic traveling through Gulf nearshore waters. Barge operations associated with dredging activities in Gulf waters would require recreational and commercial boats to avoid only the area immediately surrounding these operations and activities, which could occur up to one mile offshore. As such, the Air Force anticipates minimal impacts to recreational and commercial boaters from land mass restoration.

Impacts to Socioeconomics

Road and culvert repair would not have significant cumulative socioeconomic impacts. Some slight benefit to the economy would be realized from this and other related construction actions, specifically seawall construction repair. Rebuilding and relocation of facilities would probably occur too far in the future to have any cumulative socioeconomic impact with other construction related actions.

Effects from Land Mass Restoration

Dredging

Dredging the nearshore waters of SRI would require that other vessels avoid the immediate area for practical safety reasons. Recreational use is limited along the 17-mile length of Air Force owned SRI since much of the beach is inaccessible by members of the public. Tourist activities

that use nearshore waters like sunset cruise vessels and parasailing would have to avoid the area where dredging is occurring. The Air Force does not anticipate any loss of income for tourism since other areas are available for these activities.

Dredging would not adversely affect commercial shipping. The GIWW would not be closed and the Proposed Action would not cause traffic to increase along this waterway. The Proposed Action would occur in Gulf waters and would not affect waters of Santa Rosa Sound or Choctawhatchee Bay. There is no commercial shipping within the proposed dredge area.

Dredging may have minor effects on recreational fishermen. Recreational vessels would have to avoid the dredge area. A hopper dredge would not occupy the dredge area continuously since it fills and delivers up to four sediment loads per day. Pipeline dredges would require a wider area of avoidance since the dredge remains within the dredge area and pumps sand continuously to shore through a pipe. Other vessels would have to avoid the dredge ship and the pipe. A Notice to Mariners, which is a U.S. Coast Guard published and/or broadcast bulletin, would be required to advise boaters of the dredging operations.

Commercial fishing within the potential sand source area (out to a mile) is limited. The project area is not a major commercial fishing area. There are no major commercial fish ports in Okaloosa and Santa Rosa Counties.

Shoreline and Dune Restoration

Shoreline and dune restoration would potentially affect a small percentage of tourists in Okaloosa County for a brief duration. Eglin beaches on the east end of SRI that normally allow public access would undergo restoration activities for two to three weeks. Equipment, including bulldozers and a 36-inch pipe (for delivering dredged sediments) would pose potential hazards to beachgoers. Economic effects from decreased beach use would be minimal or non-existent since the Air Force anticipates only a one to two week closure. Effects would primarily be felt on weekends when public beach use is highest. There is no fee to use the beach so there would be no direct loss of revenue to Eglin. Some beachgoers may opt to go to other areas, or not to go to the beach at all during the land mass restoration. There may be imperceptible decreases in business expenditures for food outlets, gas or bridge tolls. If land mass restoration occurs during the winter, it would affect fewer people.

Land mass restoration would not affect recreational or commercial fishing. These activities do not occur on SRI Air Force property.

Land mass restoration would potentially have beneficial effects on commercial shipping and waterway transportation by protecting the GIWW from storm surge. Storm surge can transport large amounts of sand into Santa Rosa Sound, filling shipping channels. Restoring dunes and shorelines would limit the amount of sand transported into the GIWW during hurricanes and tropical storms.

Impacts Related to Hazardous Materials/Solid Waste

Potential cumulative Hazardous Materials/Solid Waste impacts involve multiple or combined occurrences of spills, emissions, and by-products from past, present, and future actions, and the continuous deposition of solid debris and waste. Road and culvert repair would require the removal of damaged road sections. Rebuilding/relocating facilities would require the demolition of old facilities. The debris would be removed and disposed of in area landfills. The Air Force does not anticipate the amount to represent a significant contribution to the overall amount received. Cumulative impacts from spills would not be significant since Eglin AFB requires that all spills be reported and spill control personnel be on hand during fueling operations to control any spills that do occur. Cumulative impacts from waste products would not be significant since collection and proper disposal of wastes is mandatory for all actions in which such wastes would be produced. Available environmental analyses of past, present and future actions have not identified any adverse impacts associated with hazardous materials and solid waste. With management practices in place, the Air Force does not anticipate any significant cumulative impacts with implementation of the Proposed Action. Additional discussion is provided for hazardous waste/debris likely to be generated from future land mass restoration actions.

Land mass restoration would not have significant impacts with regards to hazardous materials usage or spills. The four bulldozers and dredge barge operate using petroleum fuels. A fuel truck would periodically come to the project site as necessary to fuel the bulldozers, and the dredge would travel to Pensacola to refuel. Petroleum hydrocarbons such as POL based products would be considered hazardous waste if they were released into the environment. Potential impacts are associated with the potential for POL spills to occur and contaminate soils and water resources. The inadvertent release of small amounts of these hazardous materials through accidental spills could take place during the following activities:

- Daily bulldozer operations.
- Bulldozer refueling activities.
- Vessel and dredging operations.

All fuel handling and spill response procedures would be the same as described for the Proposed Action. The Air Force does not anticipate significant impacts from hazardous materials and waste to result from land mass restoration.

Environmental Restoration Program

Impacts to ERP sites are associated with the potential for ground-disturbing activities to affect the integrity of an ERP site (e.g., disturbing the soils). Currently only two ERP sites located on SRI are active (ST-259 and POI-405). Both sites are located in the vicinity of TS A-15; however, only POI-405 is located within the vicinity of project-related activities. To avoid potential impacts from ERP sites (Figure 3-4), the USACE or their contractor must coordinate with 96 CEG/CEVR concerning any digging during construction activities to ensure that ground-disturbing activities do not disturb adjacent ERP sites. The USACE or their contractor must contact the 96 CEG/CEVR if personnel detect unusual soil coloration and/or odors during

construction activities. Since the USACE or their contractor would avoid any ERP sites near the proposed site, Eglin AFB does not anticipate any significant impacts from the adjacent location of an inactive ERP site.

Solid Waste

Land mass restoration would not generate solid waste. The action is essentially the movement of sand from one location to another. No building or demolition is associated with land mass restoration.

Impacts to Cultural Resources

Terrestrial

Potential cumulative impacts to cultural resources would not be significant. Potential impacts to cultural resources primarily include but are not limited to projects with a construction component and heavy vehicle movement and operation. Such actions include road reconstruction/repair, the past ARG/MEU operation, and future training operations. Under any of these activities the 96th Civil Engineer Group, Cultural Resources Branch (96 CEG/CEVH) would be contacted and proper access/egress and operation points would be determined for heavy equipment and training activities. Consequently, direct impacts to known cultural resources would be avoided. Long term cumulative effects would be positive concerning the SRI building reconstruction due to future protection and stabilization of the Island and associated cultural resources from future hurricanes and other erosive episodes. Management practices identified in Chapter 6 would ensure that no cumulative effects to cultural resources occur.

The construction of dunes would provide a net benefit to the stability of archaeological resources on SRI through the mitigation of additional erosive episodes and deterioration of current island conditions. The long term and cumulative effects of this should be beneficial as well to subsurface and surface archaeological sites. From the available planned location of the dune and shoreline restoration areas there are two direct intersections of dune areas and archaeological sites. Among these are 8OK2339 and Dune #7; 8OK240 and Dune #15. Both of these sites are ineligible and the Air Force does not anticipate any significant impacts due to the dune reconstruction. In addition, several sites are close to proposed dune reconstruction areas and may be subject to increased erosion episodes due to runoff from new adjacent high slope areas. Among these are Dune #13 and sites 8OK471 and 8OK243; Dune #16 and 8OK225 and 8OK226. All four sites are considered ineligible to the NRHP and the Air Force does not anticipate any significant impacts.

Marine

There would be no significant cumulative effects to marine archaeological sites and the Proposed Action. During Land mass restoration, earthmoving and dredging equipment would potentially affect cultural resources. Prior to ground disturbing activities the USACE would coordinate with Eglin Cultural Resources (96 CEG/CEVH) to discuss proper access and egress points for earthmoving and dredging equipment.

Effects from Dredging

The removal of unconsolidated marine sands from offshore during dredging has the potential to disturb intact archaeological resources.

The portions of the project area, near East Pass, were previously surveyed during the 1950's for cultural resources. A recent check with the Florida Site Master Files further concludes that no known cultural resources exist within the area. However, Eglin Cultural GIS does document the existence of two possible underwater sites. These are shipwrecks, whose dates and authenticity have not been determined. These sites have not been formally surveyed; therefore inclusion into the National Register has not been recommended or determined. The locations of other cultural resources are unknown. Eglin is currently conducting a cultural resource assessment of both Okaloosa and Santa Rosa Islands to determine the status of previously documented sites after several active hurricane seasons in 2004 and 2005. The status of the two offshore sites mentioned above is unknown since they are not included in the current assessment. Dredging could possibly damage both known shipwrecks.

Since a formal survey has not been conducted within the area of either site, it is recommended that while surveying for sand source locations for shoreline restoration are being conducted, all possible archaeological sites be noted by sonar data and thus be avoided while implementing sand removal. Thus, areas which do contain known resources with an eligible for, potential eligible for, or listed on the NRHP, would need to be considered for impacts when located in areas that intersect with the Proposed Actions.

The primary concern would be the activity areas for pipeline or hopper dredge equipment that is placed on the seafloor, possibly near existing cultural resources. Since both types of equipment suck up sediment and water from the seafloor, existing cultural resources can be dislodged or destroyed. However, prior to the use of either type of equipment, the Air Force would require a sand source search using underwater sensing equipment. During the search, the USACE would use magnetometer instrumentation to identify the presence or absence of any metallic debris. The USACE would use acoustic Doppler to scan for any other existing debris. Dredging operations would avoid these areas.

Impacts Related to Noise

Road and culvert repair would generate noise from construction equipment but the impacts would not be significant; the noise would be minor. Additionally, no humans off of SRI or protected species resources would be exposed. The location of the road is far removed from sensitive species areas including turtle nesting beaches. Land mass restoration would not have significant noise impacts to people or wildlife, including protected species. The following analysis considers noise exposure of dredge and land mass restoration actions to people and wildlife.

Noise Effects from Dredge Operations

Noise Effects to People

There would be no effects to people from dredge noise. For those persons employed on the project, work-related hearing concerns would be addressed in accordance with federal OSHA guidelines. Other people would not be exposed to underwater dredge noise from the project. The beaches of the SRI Range Complex are not public beaches and the recreating public would not be within the waters of the project area.

Noise Effects to Aquatic Wildlife

Aquatic wildlife may hear the noise created by the dredge but are not likely to approach given the noise and disturbance. Other than changes in swimming direction or avoidance of the immediate area of the dredge action, the Air Force does not anticipate any effects. There are no underwater noise thresholds for dredge noise to animals.

Noise Effects to Protected Species

The following protected species may be exposed to dredge noise: the Atlantic bottlenose dolphin and Atlantic spotted dolphin, both protected under the Marine Mammal Protection Act (MMPA), the Gulf sturgeon, listed by the state of Florida and the ESA as threatened, and four ESA listed sea turtles (loggerhead, green, Kemp's ridley and leatherback). These sea turtle species are ESA federally listed as endangered, except for the loggerhead, which is listed as threatened.

There are no documented reports of adverse reaction from or hearing impacts to dolphins from dredge noise. In Federal Register (2003), the USACE maintained that dredging would not incidentally harass bottlenose dolphins, and has not observed any direct effects to dolphins from dredging over the many years they have been engaged in this activity. In the Federal Register (2003), the National Oceanic and Atmospheric Administration (NOAA) Fisheries agreed that noise and visual disturbance from dredging activities would have a "negligible impact" on bottlenose dolphin stocks. NOAA Fisheries has defined ''negligible impact'' in 50 CFR 216.103 as:

> "An impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival."

There is no evidence to indicate that dredge noise would affect sturgeon and sea turtles. Current concerns with dredging and these species focus on the direct effects that can result from entrainment (capture) in the dredge.

Noise Effects from Land Mass Restoration

Noise Effects to People

Noise from dune construction would not affect people. The public access areas on the east end of the SRI Range Complex would be closed to the public during dune restoration activities.

There are no safety concerns with the level of noise from bulldozers given the proximity of facilities away from proposed dune locations. The noise from bulldozers engaged in dune construction should not interfere with work at the test sites. Table 5-2 indicates that bulldozer noise levels decrease to 67-76 dBA within 400 feet.

There is a potential for shoreline restoration activities to generate noise that may affect people working at TS A-3, TS A-13 and TS A-13B. Facilities with concrete walls would potentially dampen outside noise by 24 decibels (USEPA, 1974), minimizing disturbance and interruption of the work environment. Shoreline restoration is expected to proceed at a rate of about one-tenth of a mile per day. Thus, any potential for noise disturbance from bulldozers engaged in shoreline restoration would be limited to one to two days near a given test site.

Table 5-2. Bulldozer Noise Levels in A-weighted Decibels

Equipment	Distance From Equipment Sound Source (feet)			
	50	100	200	400
D-9 Caterpillar Bulldozer	85-94	79-88	73-82	67-76

Source: USDOT, 1977

Noise Effects to Animals

Potential effects from noise would occur to wildlife and birds from shoreline restoration and dune construction. The noise and visual disturbance associated with bulldozing would likely cause animals to temporarily leave the area. Interruption of feeding, breeding, nesting or care of young could result. The rate of shoreline restoration and dune construction would proceed about one-tenth of a mile per day. Thus, the noise would not be centered on any one location, but spread out over the 17 miles of the SRI Range Complex and over a period of four to five months. To minimize the effects of noise disturbance, which would occur in conjunction with the more destructive forces of earth moving, conducting the action during the winter months is recommended.

Impacts to Biological Resources

Terrestrial Biological Resources

Cumulative impacts to certain sensitive species and habitats are possible. The Proposed Action and future land mass restoration may have cumulative impacts on sea turtle nesting and hatching success due to the potential short-term degradation of nesting habitat, and potential harassment and direct physical impacts from equipment operations on the beaches. Road and culvert repairs could affect the Florida perforate lichen, a protected species. Construction contractors would be required to stay out of areas where this species is found (Figure 3-6). Relocation of facilities has the potential to affect shorebirds and other wildlife, though specifics cannot be assessed at this time. The future locations have not been determined. Demolition of old facilities would have to be accomplished in such a way as to minimize effects to sea turtles and shorebird species. ARG/MEU activities that occur during sea turtle season may also add to potential impacts to sea turtles from harassment, direct physical impact, and habitat alteration. Nest relocation will likely be required for the Proposed Action, land mass restoration, as well as for future ARG/MEU

training, and adjacent land mass restoration projects. All of these actions could cause cumulative impacts to sea turtle populations. The Air Force anticipates long-term positive cumulative impacts for sea turtle nesting habitat, beach habitats, and dune habitats from land mass restoration activities. There may be short-term increases in disturbance from equipment and people to piping plovers, shorebirds, and Santa Rosa beach mice from road repairs, ARG/MEU, and adjacent land mass restoration projects, but the Air Force does not anticipate any cumulative impacts. The Air Force does not expect any cumulative impacts to piping plover critical habitat. Additional discussion on impacts from land mass restoration is provided as follows.

Effects from Landmass Restoration

Landmass restoration effects would potentially occur to biological resources from shoreline restoration and dune construction activities. These activities have the potential to directly kill, injure, or temporarily displace terrestrial and marine species including protected species.

Effects to Lower Beach and Surf Zone Organisms from Shoreline Restoration

Shoreline restoration would have direct effects to lower beach and surf zone animals over the entire 17-mile length of the project. Bulldozers would spread newly dredged sand in an area extending from the lower beach to 150 feet from shore, creating about 300 acres of new beach. Animals within that area would be buried, and may not be able to immediately re-establish themselves within the newly compacted beach sediment. Numbers and different kinds of species would initially decrease. Some species may survive burial. Studies indicate that some surf zone organisms can tunnel up through 40 to 90 cm of sediment, especially if sediment grain size is similar to that of the original beach (ASFMC, 2002). Frequently, shoreline restoration projects result in new sediment layers that are deeper than organisms can tolerate (ASMFC, 2002).

Species most likely to be directly affected by shoreline restoration include worms, the coquina clam (*donax sp.*), the mole crab (*Emerita talpoida*) and the ghost crab (*Ocypode spp.*). These species are a good indicator of the relative health of the beach area, and are an important food species for fish, crabs and shorebirds (ASMFC, 2002). Different studies have shown shoreline restoration and beach bulldozing to have adverse effects, no effects or even positive effects on some surf zone and lower beach species. Abundance of coquina clams and mole crabs decreased by half to nearly 100 percent following two shoreline restoration projects (ASMFC, 2002). Three months after beach bulldozing, ghost crab densities were down by 55-65 percent. Ghost crab populations were significantly reduced six to eight months following bulldozing. On one beach, recovery of coquina clams took over a year, while at another a 100 percent increase in abundance of this species was seen following beach bulldozing. The difference in effects to surf zone species populations appears strongly related to the timing of the action, and to the sediment characteristics of the material used to rebuild the beach. Grain size and compaction of new sediments can adversely affect the ability of surf zone organisms to feed or bury, exposing them to wave action and predation. Negative effects have been attributed to high silt or fine sand content in the shoreline restoration material. No long-term effects to surf zone organisms were observed for a restoration project in Panama City Beach, Florida (ASMFC, 2002). Researchers stated recovery occurred within one year at that location. The USACE (USACE, 2001) reports examples of more rapid recoveries of two weeks at one location and two months at another

shoreline restoration project. The rate at which beach infauna populations recover is dependent on closely matching the sediment characteristics of the original beach and temperature. For one study, shoreline restoration activities ceased in the early fall, allowing infauna to continue colonizing the new surf zone area (USACE, 2001). Researchers recommend conducting shoreline restoration within the winter months when surf zone populations and new species recruitment are at their lowest to minimize impacts (Dial Cordy and Associates, 2002). Recovery was not detected for beaches renourished annually (ASMFC, 2002). The literature supports that maintenance of healthy beach ecology following shoreline restoration is dependent on allowing sufficient recovery time (greater than one year) between new sand applications. Though the immediate effects are adverse, shoreline restoration can have long-term positive effects by creating habitat for surf zone species, particularly for beaches that have suffered substantial erosion.

Effects to Protected Species from Shoreline Restoration

Effects to Sea Turtles

Shoreline restoration on the SRI Range Complex would impact sea turtles and their habitat, primarily from night activities during sea turtle season (1 May through 31 October). Potential effects include direct physical impacts, harassment, and habitat impacts from equipment and personnel on the beach, and changes in the beach structure and composition from the newly deposited sand. Shoreline restoration activities would involve around the clock activity on the beachfront for up to five months, with at least a portion of this five month period overlapping with sea turtle season. The sand/water mixture dredged from offshore would be piped onto the beach near the waterline through a 36-inch pipe. The sand would then be moved into place by two to four bulldozers to build out the beach area an additional 150 feet seaward.

Equipment operation on the beachfront during sea turtle season (1 May to 31 October) may cause direct physical impacts to sea turtle adults and hatchlings in the shoreline restoration area. To the greatest extent possible, nighttime shoreline restoration activities would be minimized during sea turtle season, but it is likely that at least some of the operation would occur during sea turtle season. For the times that the two overlap, vehicle operators would be instructed to remain alert at all times to the potential presence of sea turtles on the beach. If a sea turtle were observed on the beach during activities, bulldozers would be turned off and operators would remain quiet, allowing the turtle to continue her activities. If hatchling turtles were observed on the beach, all activities would cease until the hatchlings reached their destination. Additionally, shoreline restoration activities would not occur within 200 feet of any nest past day 60 incubation, so the Air Force does not anticipate direct impacts to hatchlings.

To determine the number of turtles that shoreline restoration activities would potentially directly impact, calculations were done to determine the number of nests laid per night per segment of beach where activities were occurring. Using Figure D-1 in Appendix D, peak nesting season was estimated to be June for loggerheads and July for green sea turtles. Dividing the average number of nests occurring in June by 30 days yields a peak nesting emergence rate of 0.459 loggerhead nests per night. By the same method, during a green turtle nesting year, the peak

nesting rate is calculated to be 0.277 green nests per night (number of green turtle nests in July, divided by 31 days).

Once the peak nesting rate was determined, the approximate length of beach affected per night was calculated by dividing the length of the Eglin SRI beach (17 miles) by the length of time that operations would be occurring (4-5 months, or 120-150 days), then dividing that by 2 (because potential effects to nesting turtles would only occur at night). Bulldozers would be moving sand along approximately 0.07 mile of beachfront per night, which would be the area for potential direct physical impacts each night. The peak rate of turtle nesting emergences per night was then divided by 242 (number of 0.07-mile segments of beachfront affected per night), which provided the maximum number potentially impacted per night per 0.07-mile segment of beachfront. The peak rate of loggerhead turtle nesting emergences is 0.0019 nests per night per 0.07 mile, and the peak rate of green turtle nesting emergences is 0. 0011 nests per night per 0.07 mile. Assuming the peak emergence rate (see above) occurred every night of sea turtle nesting season, and that shoreline restoration activities were occurring every night of sea turtle nesting season (1 May through 31 August, or 122 days), direct impacts to a maximum of 0.23 adult loggerheads and 0.13 adult green sea turtles could occur.

During sea turtle season, equipment activity on the beachfront at night may harass sea turtles by causing changes in the nesting behavior of adult sea turtles, changes in the behavior of hatchling sea turtles, nest destruction, ruts, and missed nests and hatching events during routine nesting surveys. Nesting turtles may be deterred from entering the beach because of noise and light from equipment. Bright lights may result in the disorientation (loss of bearing) or misorientation (incorrect bearing) of sea turtle hatchlings, which increases the exposure of the hatchlings to predation and desiccation. Equipment could crush sea turtle nests, and ruts created by equipment may impede hatchling movement. Equipment operations may obscure or obliterate evidence of sea turtle nests and hatching events.

To avoid these impacts, efforts would be taken to complete as much of the shoreline restoration activities as possible outside of sea turtle season, but it is likely that at least some of the operation would occur during sea turtle season. For the times that the two overlap, vehicle operators would be instructed to remain alert at all times to the potential presence of sea turtles on the beach. If a sea turtle were observed on the beach during activities, bulldozers would be turned off and operators would remain quiet, allowing the turtle to continue her activities. If hatchling turtles were observed on the beach, all activities would cease until the hatchlings reached their destination. Additionally, the use of lights during nighttime operations would be minimized, and all headlights would be covered with the appropriate sea turtle filter material.

Because equipment would be running on the beach around the clock, it is possible that equipment may obscure or obliterate evidence of sea turtle crawls before early morning surveys, adversely affecting the ability to identify, index, and monitor nests, as well as impede the ability to carry out avoidance and minimization procedures such as nest relocation actions that would help to minimize potential impacts from shoreline restoration activities. Equipment operators would be instructed to contact the 96 CEG/CEVSN immediately if a sea turtle was spotted on the beach so that the nest could be documented. The operator would turn off the bulldozer and

remain quiet until the turtle had returned to the water, then would avoid all activities near the nest.

Restoration would begin at the water's edge and build seaward, so any nests that have already been established prior to the initiation of work would likely not be at risk because they would be further inland. However, to minimize the potential affect that could occur to these nests, all sea turtle nests would be marked and protected in accordance with established 96 CEG/CEVSN protocol. 96 CEG/CEVSN biologists would install a series of stakes and highly visible survey ribbon to establish a radius surrounding the nest. No activity would occur within this area. Nests at risk would be relocated in accordance with guidelines of the USFWS Section 7 consultation incidental take statement.

To ensure that no ruts would interfere with the hatchlings' crawl to the sea, shoreline restoration activities would not occur within 200 feet of any nest past day 60 incubation regardless of the time of day or night. This measure, in combination with the other measures in this section, would also minimize the potential for harassment impacts to hatchlings from noise and lights.

To determine the number of turtles potentially harassed by shoreline restoration activities, calculations were done to determine the number of nests laid per night per segment of beach where activities were occurring. For harassment impacts, as a conservative measure, it was assumed that impacts to turtles could extend for 0.5 mile. To determine the peak nesting rate within a 0.5-mile section of beachfront, the peak nesting emergence rate for each species (see Direct Physical Impacts section above) was divided by the number of 0.5-mile segments comprising Eglin AFB sea turtle nesting beach (i.e., 34). Therefore, the peak rate of loggerhead turtle nesting emergences is 0.014 nests per night per 0.5 mile, and the peak rate of green turtle nesting emergences is 0.008 nests per night per 0.5 mile. Assuming the peak emergence rate occurred every night of sea turtle nesting season, and that shoreline restoration activities were occurring every night of sea turtle nesting season (1 May through 31 August, or 122 days), a maximum of 1.71 loggerheads and 0.98 green sea turtles could be harassed.

On the island, the peak hatching occurrences per night per 0.5 mile for loggerheads and green sea turtles is approximately 0.010 and 0.006 hatchings, with an average of 66 and 49 emerged loggerhead and green hatchlings per nest, respectively. Assuming the peak hatching occurrence rate occurred every night of sea turtle hatching season, and that shoreline restoration activities were occurring every night of sea turtle hatching season (1 July through 31 October, or 122 days), a maximum of 81 loggerheads hatchlings and 36 green hatchlings could be harassed.

Effects to Sea Turtle Habitat

Shoreline restoration would result in the addition of 150 feet of beach over a length of 17 miles, which is intended to replace the sand lost in recent hurricanes. While shoreline restoration of the beach would likely have a long-term positive impact for sea turtles on SRI through the creation of nesting habitat, there would be alterations to the Island's beach topography and composition. Potential impacts include changes in sea turtle nesting patterns due to berms and compacted sands, and changes in sea turtle egg development due to alteration of sediment properties such as moisture and temperature.

Shoreline restoration projects can cause rapid erosion leading to what is known as escarpments (small cliffs) along the shoreline. These berms may interfere with sea turtle nesting behavior. If the "cliffs" exceed 18 inches in height, they can hinder turtles from reaching their nesting sites (Schmitt et al., 2001). As a result, turtles may either return to the sea without laying their eggs, or they may lay their eggs closer to the waterline, where they might be washed out. While there may be short-term impacts from these berms, after a couple of years, these berms tend to even out (Steinitz et al., 1998).

Another impact that has been noted at many renourished beaches is that sands of nourished beaches are often more compacted than natural beaches, hindering efforts by nesting sea turtles to bury eggs and leading to false crawls (ASMFC, 2002). At Juniper Beach, FL, greater surface hardness was positively correlated with false crawls (Steinitz et al., 1998). Periodic tilling to soften the sand has been used in some areas to make it easier for turtles to dig into the renourished sands (SWCC, 1999). Without tilling, sands usually return to a more natural density within a few years (ASMFC, 2002).

Changes in sediment moisture, color, sand grain size, organic content, gas diffusion rates, and substrate temperature caused by shoreline restoration can influence sea turtle egg development. Increased water retention on nourished beaches can impede gas exchange in the nest, and incubation times may be altered due to changes in sand temperature. Because the sex of the hatchlings is temperature dependent, future sex ratios in the turtle population may be skewed at renourished beaches with darker sands (Schmitt et al., 2001).

To minimize the potential for impacts to sea turtle habitat from nourishment activities, the USACE would conduct a sand source analysis prior to dredging. The analysis would ensure that particle size and color of the sands to be used for shoreline restoration closely matched the beach sands on SRI. Additionally, periodic tilling would be conducted to soften sands. Even with these measures, there would likely be at least short-term impacts to sea turtles from habitat alteration. However, shoreline restoration would have beneficial long-term impacts through the creation of potential sea turtle nesting habitat. Shoreline restoration would affect 17 miles of sea turtle nesting beaches.

Effects to Shorebirds from Shoreline Restoration

Some shorebirds may be temporarily displaced as a result of noise from equipment and personnel during shoreline restoration activities and direct impact to shorebird nests may occur. Land mass restoration has the potential to affect colonies or individual nests of several state-listed shorebird species (least terns, southeastern snowy plovers, and black skimmers) which are usually found along the rack line or other suitable habitat along the beach. Land-based activities near shorebird nesting areas may result in a flush/startle response. During nesting season, this may result in a potentially increased vulnerability of eggs and chicks to predation. However, foraging species would typically move on to other areas, while nesting species would return after the general disturbance was over. These activities would also likely scare other species such as predators

(e.g., feral cats, coyotes, etc.) from the area, thus reducing the chances of nest predation should nesting birds be flushed.

Effects to Piping Plover and Critical Habitat from Shoreline Restoration

Impacts to piping plovers and their designated critical habitat are unlikely because the proposed shoreline restoration would be on the beach and critical habitat is on the Sound-side of SRI. It is possible that piping plovers may be present on other parts of SRI besides the designated critical habitat area, so there is the potential for noise associated with the use of equipment to impact some plovers. However, displacement would be temporary and localized. Shoreline restoration is not likely to adversely affect piping plovers and would have no effect on designated piping plover critical habitat.

Effects to the Santa Rosa Beach Mouse from Shoreline Restoration

It is unlikely that the shoreline restoration activities on SRI would have impacts on the Santa Rosa beach mouse. The primary foraging and sheltering habitat of the beach mouse is within the sand dunes of SRI; the beach mouse is not usually found on the beach or below the MHWL. Therefore, shoreline restoration activities would not have significant impacts on the beach mouse or its habitat.

Effects to Protected Species from Dune Restoration

Effects to Sea Turtles from Dune Restoration

Dune restoration activities have the potential to affect sea turtles through nest destruction, rut creation, and habitat alteration. Noise and lights from nighttime dune restoration activities have the potential to disturb adults or hatchlings.

Nests located at the dune restoration site or between the restoration site and the area where dredged sand is deposited on the beach would be at risk for impacts because sand would be bulldozed from the beach inland to the dune restoration sites. To ensure that any nests in the proposed restoration areas were identified, nesting surveys would be initiated 70 days prior to activities or by 1 May, whichever is later. Surveys would continue through the end of the project or through 1 September, whichever is earlier. No restoration activities would begin until after the daily turtle survey and nest conservation and protection efforts were completed. All sea turtle nests would be marked and protected in accordance with established 96 CEG/CEVSN protocol. 96 CEG/CEVSN biologists would install a series of stakes and highly visible survey ribbon to establish a radius surrounding the nest. No activity would occur within this area. Nests at risk would be re-located.

Dune restoration activities have the potential to alter sea turtle habitat, but the Air Force anticipates overall impacts to be positive. Most of the dune restoration sites are completely flat and nearly unvegetated due to recent storms. Restoration of these dunes would have multiple positive effects, including re-establishment of vegetation, stabilization of sediments, and increased shielding of the beach from lights on the mainland.

Most of the dune restoration sites are not near nesting beaches, but transit through beach areas would occur. Bulldozers would be pushing sand that had been deposited on the beach inland to the dune restoration sites. To minimize impacts to sea turtle habitat, the bulldozers would push the sand up along a narrow corridor and then spread the sand out laterally once at the dune restoration site. Existing dunes would be avoided.

Effects to Shorebirds from Dune Restoration

Dune restoration work, primarily activities near TS A-4 and A-3½, has the potential to impact nesting birds as a result of noise from equipment and personnel, and could also directly impact nesting habitat. Land mass restoration activities may affect colonies or individual nests of several state-listed shorebird species (least terns, southeastern snowy plovers, and black skimmers). Land-based activities near shorebird nesting areas may result in a flush/startle response. During nesting season, this may result in a potentially increased vulnerability of eggs and chicks to predation. However, foraging species would typically move on to other areas, while nesting species would return after the general disturbance was over. These activities would also likely scare other species such as predators (e.g., feral cats, coyotes, etc.) from the area, thus reducing the chances of nest predation should nesting birds be flushed.

Effects to Piping Plovers and Critical Habitat from Dune Restoration

Dune restoration activities near TS A-17A would occur close to designated piping plover critical habitat, and could potentially impact piping plovers, primarily from noise. Piping plover critical habitat has been re-marked since Hurricane Ivan and is clearly visible. Personnel would be instructed to stay away from the posted critical habitat area.

Research indicates that patterns of piping plover habitat usage can be very complex, and plovers could feasibly use several locations on the island for foraging, roosting, or sheltering at any time, day or night. Therefore, if land mass restoration actions take place during the piping plover winter foraging period (mid-July through mid-May), it is possible that piping plovers may be present in the action area and impacts could occur. It is possible, though highly unlikely, that dune restoration work could cause direct physical impact to an individual plover if the bird attempted to land on a work site. It is more likely that restoration activities would serve to flush the bird from the area, possibly causing stress and extra caloric expenditure. The disturbance generated by restoration activities would be sufficient to keep piping plovers from foraging in the work area during the course of the operation. During this time, displaced plovers may simply move on to undisturbed foraging areas. Displacement would be temporary and localized.

Because the risk of direct physical impact is slight and indirect disturbance would be temporary and localized in nature, dune restoration activities on SRI are not likely to adversely affect the winter foraging piping plover population. Dune restoration activities would not occur in designated critical habitat, so there would be no effect to designated piping plover critical habitat on SRI.

Effects to the Santa Rosa Beach Mouse from Dune Restoration

It is unlikely that dune restoration activities on SRI would have negative impacts on the Santa Rosa beach mouse, and dune restoration activities would likely have a long-term positive impact on beach mouse populations and habitat. Potential for direct impacts to the Santa Rosa beach mouse from dune restoration activities is extremely low due to the fact that beach mice tend to spend much of their time in burrows that they excavate in the dunes. Because the areas proposed for dune restoration have no dunes, there would likely be very few beach mice present in these areas.

Dune restoration activities would be avoided in areas with established dunes, which would substantially reduce potential impacts to beach mice and their burrows. Avoiding established dunes would also reduce impacts to the dune vegetation, which serves as a food source for this species. Dune restoration activities would not adversely affect the Santa Rosa beach mouse or its habitat, and would likely have long-term positive impacts through the creation of new habitat.

Marine Biological Resources

The Proposed Action would not have significant cumulative impacts in conjunction with other past and present actions. The area the Proposed Action would affect is confined to the immediate area around the seawall structures, and the effects are temporary. The primary potential for cumulative impacts is from the simultaneous conduct of dredging and shoreline restoration activities at adjacent counties with future land mass restoration activities. Because shoreline restoration can remove or eradicate many species within the surf zone and beach face, the combined effect from multiple projects could deprive shorebird species of important food sources while decreasing alternate feeding areas. Repetitive dredging of sand in offshore areas will eventually deplete optimum sand, and the associated benthic organisms. Repetitive dredging and shoreline restoration events that occur on an annual basis would not allow for adequate recovery of benthos from borrow sites and surf zone organisms from restored shoreline areas. Since adjacent projects are presently underway or scheduled to start in 2006, there is little opportunity for a direct overlapping of effects from future land mass restoration on SRI, which would have a potential start date sometime beyond 2007 or later. Military missions such as the ARG/MEU, would potentially have minor cumulative effects but are brief in duration with the most intense use confined to a relatively small area (e.g. crossover points). The effects to the benthos from the ARG/MEU are on a much smaller scale than the Proposed Action or land mass restoration. Finally, there are potential cumulative risks for sea turtles and Gulf sturgeon from dredge entrainment. To offset these risks, the NOAA Fisheries has established sea turtle and Gulf sturgeon take limits for all dredging operations within the Mobile District of the Gulf of Mexico (which includes the project area). Once these limits are reached, dredging operations will cease and consultation between the USACE and NOAA Fisheries will resume to re-evaluate the potential for impact to these protected species. Additional analysis is provided on potential effects to marine biological resources from dredging associated with land mass restoration.

Effects from Dredging

Benthos

Dredging would have direct and indirect adverse effects to benthic organisms, which are animals living on or within the sediments of the seafloor. Benthic organisms affected include mollusks (snails and clams), crustaceans (crabs and shrimp), echinoderms (sand dollars and starfish), annelids (worms), small fish, fish eggs and fish larvae. The Air Force anticipates the area affected to be less than 1200 acres. Direct effects would occur as the hopper or pipeline dredge head suctions sediment from the sand source location. Dredging removes most organic matter, upon which benthic organisms feed, and directly reduces benthic populations by 84-90 percent according to several studies (ASMFC, 2002). Benthic organisms would be killed from the force of the suction or from exposure after being deposited on the beach.

Indirect effects would be adverse but on a lesser scale than direct effects. As the dredge operates, sediments would be suspended into the water and could bury adjacent benthic communities. All dredge material operations result in some sediment suspension into the water column. Pipeline dredges with hydraulic cutterheads produce small sediment plumes that disperse quickly, while hopper dredge and barge operations introduce much larger amounts of sediment into the water column (Reine et al., 2002). Pipeline dredges, which pump dredged material directly to the shore, would produce less suspended sediments than hopper dredges, and have fewer indirect effects to benthic organisms.

Long-term effects (greater than one year) may potentially occur. Studies indicate that diversity or the numbers of different types of species greatly declines at recovered dredge sites. Recovery or recolonization of the dredged site to pre-dredge conditions (in terms of species composition, abundance and diversity) may take several months or several years. If the site does not experience high sedimentation or continued dredging, recovery to previous levels of species abundance and biomass should occur within 1-5 years (Blake et al., 1996). Studies for dredge sites at nearby Panama City Beach indicated recovery periods within one year (ASMFC, 2002). Species composition may not be the same after recovery, even though numbers, biomass and diversity approach original levels (MMS, 1999). Longer recovery times have been observed at sites that were dredged a second time (ASMFC, 2002). Recovery time may depend on several factors such as the type of organisms present at the site before dredging, the type of dredge equipment used, the duration of dredging operations, and the amount of sand removed (ASMFC, 2002). Density and abundance of opportunistic species (those that appear first or better withstand site disturbance) may increase. Debate exists over whether the new benthic community of a recovered dredge site functions the same as the original community in terms of the food and energy it supplies to the ecosystem (ASMFC, 2002). Changes in species composition could result in changes in prey species distribution, meaning prey species would no longer feed at that location. Recovery may be more rapid with utilization of a hopper dredge, and at least one state (South Carolina) recommends its use over other dredge devices (ASMFC, 2002). Hopper dredges remove shallow layers of sediment over large areas, as opposed to pipeline dredges which dig deeper within a smaller area. The hopper dredge operation would leave a series of ridges and furrows in the sea floor which researchers believe provides an immediate sediment source for recolonizing animals (ASMFC, 2002). Shallow removal of

sediments moderates changes to bottom topography. Minimal alteration to bottom topography may decrease effects to wave patterns, currents and sediment deposition. The use of a hopper dredge would result in less infilling of fine-grained sediments, which support a less diverse biological community.

Animals in the Water Column

Dredging would have minor effects to animals living within the water column. Adult fish would be capable of swimming away from the dredge; thus, there would be no direct effects to adult fish. Smaller fish, invertebrates, plankton and zooplankton would be entrained (captured) by the suction of the dredge. One study estimated post-larval (an early life stage) shrimp were entrained at a rate of about 2,000 shrimp per day. At this rate, shrimp mortality from dredging would approach 300,000 individuals over the duration of the project. Entrainment rates of fish by dredges are typically less than .01 individuals/cubic yards (Ault et al., 1998). For the volume of sediment proposed for dredging, this rate would result in about 40,000 mortalities of small fish. Fecundity (the rate at which a species reproduces) of many fish species in the northern Gulf is very high. For example, during spawning season (April through September) a female cobia, a fish targeted by sport fishermen, may produce an average of over 300,000 to 2 million eggs every five days (Brown-Peterson, et al., 2001). One female white shrimp may produce up to one million eggs per spawn. Pinfish, commonly used for bait, produce an average of 20,000 eggs and may spawn multiple times during the fall and winter months. A female croaker may produce up to 180,000 eggs per spawn (Oesterling, et al., 2004). Given the high reproductive rates of fish and invertebrates that occur within the proposed dredge site, mortality from dredging over the four to five month project duration would be insignificant.

Indirect effects to fish and invertebrates would result as the dredge would remove potential food sources from the site. Increases in turbidity may have temporary affects on fish feeding. Some species of fish feed over a wide geographic area, or spend only a part of their life-cycle in a given area (ASMFC, 2002). The loss of potential food sources within the relatively small geographic area of the dredge site would not be significant given the availability of food at other similar locations. Fish such as catfish and whiting that feed mainly on benthic infaunal organisms were not affected in one study (ASMFC, 2002). Increases in turbidity have been shown to reduce feeding response in flounder and menhaden. Turbidity did not affect pinfish, croaker and spot feeding response (Colby and Hoss, 2004).

Short-term effects (less than one year) would likely occur to fish populations. Studies on recovery of fish populations at dredge sites vary in their conclusions, though several conclude recovery within one year (ASFMC, 2002; Burlas et al., 2001). Some found no impact, while others documented an increase in abundance, possibly from sediment disturbance releasing nutrients and infauna into the water column. The composition of finfish was similar and abundance did not change at one dredging site along the Atlantic Coast (Burlas, et al., 2001).

Protected Species

While several protected species occur within the proposed project area, effects from dredging are either minimal or will be negated by implementing protective measures. NOAA Fisheries issued

a biological opinion in 2003 addressing the potential effects of hopper dredges to protected species in the Gulf of Mexico and Atlantic Ocean. NOAA Fisheries determined that effects would not occur to whales, leatherback sea turtles, and the smalltooth sawfish since these species are either not likely to occur in nearshore waters or have no history of hopper dredges affecting them (NOAA Fisheries, 2003). Effects to the West Indian manatee would most likely not occur given its infrequent appearance in northern Gulf estuaries.

There would be no direct effects from dredging to dolphins, which are strong swimmers. Collisions with the slow moving dredge vessels are unlikely. Additionally, the noise and disturbance may cause them not to approach the area where dredging is occurring. Indirect effects would be minimal. Some loss of prey species may occur but effects would be minimal since the area affected would be small relative to the available area. Dolphins are transient feeders, traveling over a wide area. A consultation with the NOAA Fisheries for potential effects to bottlenose dolphins is not required.

Pipeline dredges are not known to pose a direct threat to sea turtles, and entrainment is not expected from this type of dredge (NOAA Fisheries, 2003). Sea turtles would be susceptible to entrainment and direct effects from a hopper dredge. For this reason, the Air Force would implement a protective measure for use of hopper dredges. The USACE would employ a trawl (a net towed behind a vessel) continuously in front of the dredge to remove sea turtles before they can be harmed. The USACE would release the turtles away from the dredge. The USACE has successfully used this method to prevent impacts to sea turtles at a dredging and shoreline restoration project in Panama City Beach, Florida. No sea turtles have been injured or killed during that operation (USACE, 2005). Several have been captured and removed. NOAA Fisheries has issued a Programmatic Biological Opinion to the USACE for potential effects to sea turtles from dredging in the northern Gulf and Atlantic (NOAA Fisheries, 2003). That biological opinion would be incorporated by reference for dredging that would be required to accomplish land mass restoration. The take statement contained with that biological opinion specifies the number of sea turtle and sturgeon takes allowed by dredging actions within the Mobile District, which encompasses the project area. To date, no injury or mortality takes have occurred within the Mobile District, due to the preventative trawling. The take statement excerpted from the 2003 biological opinion is as follows:

> "For the Mobile District, the documented annual incidental take by hopper dredges, by injury or mortality, is expected to consist of three (3) Kemp's ridley, three (3) green turtles, one (1) hawksbill, five (5) loggerhead turtles, and two (2) Gulf sturgeon per fiscal year for all channel dredging and sand mining by hopper dredge in the Mobile District. A greater number of Gulf sturgeon is included in the incidental take level predicted for the Mobile District than the New Orleans District due to the greater abundance of Gulf sturgeon, and larger areas of designated Gulf sturgeon critical habitat, in the former.

USACE would contact NOAA Fisheries and wildlife (96 CEG/CEVSNW) immediately if a sea turtle or sturgeon is injured or killed by the dredge. Exceeding the allowed number of takes for any species would require immediate cessation of dredging activity.

Dredging would potentially have direct effects to the Gulf sturgeon during the winter (September through May) months. Sturgeon spend the summer months in fresh water rivers. To prevent these effects USACE would trawl the area in front of the dredge by a separate vessel to remove sturgeon at risk from being entrained in the dredge. The captured sturgeon would be released away from the dredge. The USACE has successfully used trawling for a dredge and beach restoration project in nearby Panama City Beach to prevent impacts to sturgeon. No sturgeon have been injured or killed at the Panama City Beach operation, which is similar in scale to future SRI land mass restoration. Trawling would be mandatory. Capturing sturgeon, even for their benefit, represents a non-lethal effect requiring a take permit from the USFWS.

Indirect effects to the Gulf sturgeon would result from a loss of prey species within the 1,200 acre dredge area. Sturgeon feed over sandy bottoms on crustaceans, mollusks, worms and small fish, species inhabiting the benthos of the proposed project area. Sturgeon do not reside in a particular area but move about in search of food. Sufficient food resources would be available from adjacent areas; therefore, indirect effects to the sturgeon from loss of food resources within the dredge site would not be significant. Sturgeon feed within the Gulf critical habitat but spawn in rivers. Thus, effects to reproduction would not occur and land mass restoration would not have long-term effects to this species.

Gulf Sturgeon Critical Habitat

Dredging would occur within Gulf sturgeon critical habitat. Dredging would remove benthic species, which the Gulf sturgeon feed on, from up to a 1,200 acre area, which is approximately 10 percent of the total Gulf sturgeon critical habitat within the nearshore (out to one nautical mile) region of the SRI Range Complex. Recovery of benthic species at dredge sites would likely occur within one to five years. Consultation with NOAA Fisheries would be required for potential effects to Gulf sturgeon critical habitat.

Essential Fish Habitat

The nearshore area of the SRI Range Complex supports a variety of fish species, primarily small species and juveniles of larger fish species (ASMFC, 2002). Essential fish habitat for many of these species occurs within the project area (see Chapter 3, Table 3-12). The total area of essential fish habitat varies for each species but typically extends the length of the northern Gulf coastline and out to several miles from shore. Thus, the affected area of EFH constitutes a minor fraction of the available area. Effects to bottom habitat EFH would also be temporary, with previously stated recovery periods occurring within one to five years. The Air Force expects the effects from dredging on EFH to be minimal.

Effects to these EFH resources would not occur: coral reefs, hardbottom areas, submerged aquatic vegetation (seagrass beds) and artificial reefs. Coral reefs, hardbottom areas and seagrass beds are not found in the nearshore waters offshore of the SRI Range Complex. The USACE would avoid artificial reefs.

5.2 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

NEPA requires that environmental analysis include identification of any irreversible and irretrievable commitment of resources that would be involved in the implementation of the Proposed Action or any Alternatives.

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the uses of these resources have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action (e.g., extinction of a threatened or endangered species or the disturbance of a cultural site).

Natural Resources

Seawall construction would not result in an irreversible and/or irretrievable commitment of physical natural resources.

Most environmental consequences are short-term and temporary (e.g., decreases in water quality from turbidity). Construction activities would require consumption of limited amounts of materials typically associated with construction (e.g., steel, concrete). The Air Force does not expect the amount of these materials used to significantly decrease the availability of the resources. Small amounts of nonrenewable resources would be used; however, these amounts are not considered to be appreciable and are not expected to affect the availability of these resources.

Commitments to the Project

The analysis of the irreversible and irretrievable commitment of resources has also been interpreted to mean that NEPA planning should be conducted such that the proponent does not commit resources towards a project prior to completion of the required environmental process. From this perspective the Air Force has made no such commitment.

No irretrievable or irreversible commitment of resources would occur under the No Action alternative.

6. MANAGEMENT REQUIREMENTS

This section lists management requirements or practices that the Air Force would implement as part of the Proposed Action or for reasonably foreseeable future actions. The USFWS has developed Terms and Conditions for the Proposed Action through Section 7 Consultation with the Air Force (see Appendix G Attachment G-2, Final BO). Management requirements have been identified for Soil and Sediment resources, Wetland Areas, Hazardous Materials and Solid Waste, Cultural Resources and Biological Resources.

6.1 SECTION 7 CONSULTATION

The Air Force will comply with Terms and Conditions as stated in the USFWS Final BO (Appendix G, Attachment G-2). Terms and Conditions are categorized as follows:

- Proposed Work (page 38 of the BO).
- Species Protection (page 39).
- Species Monitoring (page 40).
- Habitat Protection, Impact Evaluation, Restoration and Maintenance (page 41).
- Reporting (page 41).

The USFWS also provided the Biological Opinion Conservation Recommendations, which begin on page 41. The Air Force will consider Conservation Recommendations that can be achieved compatibly, feasibly, and economically with the objectives of the Proposed Action.

6.2 WETLAND AREAS

Wetland management requirements listed below pertain to potential impacts from land mass restoration, specifically dune reconstruction.

- Avoidance of wetland areas during dune construction is mandatory. The boundary of wetland areas would be identified by construction barrier (for example snow fence) and bulldozers would avoid these areas.
- An Eglin Natural Resource biologist or wetland scientist would be onsite as required to ensure that bulldozing operations avoid wetlands.

6.3 SOIL AND SEDIMENT RESOURCES

Soil management requirements listed below pertain to potential impacts from land mass restoration.

- Soils would be physically amended by mechanical tilling. Alleviation of compacted soil layers will require the use of specialized tillage implements that are pulled through the

compacted soil layers. Tillage implements typically used to alleviate subsurface soil compaction include chisel plows, rotary tillers, subsoilers, and rippers.

- Soil recovery operations should be conducted as soon after construction as possible and prior to vegetative plantings.
- Treated areas should be dressed with lighter weight tractors. Some dune areas may need to be dressed with hand tools.
- Soil penetrometers should be used to test post-construction impact zones to define the characteristics of the compacted soil layers prior to implementing soil recovery or other ecosystem mitigations.
- Soil recovery operations should not be conducted during wet periods.

6.4 HAZARDOUS MATERIALS AND SOLID WASTE

- The construction contractor would recycle C&D debris to reduce the total deposited in area landfills.
- The construction contractor will coordinate with local county and private landfill operators prior to demolition or construction to aid in equal distribution of debris and reduce any unanticipated impacts associated with the disposal.

6.5 CULTURAL RESOURCES

- The USACE and construction contractors will avoid archaeological sites. Eglin AFB Cultural Resources 96 CEG/CEVH will construct or place barriers such as fences or marking sites in the field and on maps to identify areas to avoid.
- Offshore dredging should be preceded by bottom surveys (i.e.,: magnetometer, side scan sonar) to determine presence/absence of potential cultural resource sites
- When avoidance of sites is not feasible, Eglin AFB Cultural Resources 96 CEG/CEVH and the Florida SHPO will employ alternative means (for example, data recovery) to reduce or eliminate the potential for impact to cultural resources.
- The USACE and construction contractors will avoid areas where artifacts can be seen on the surface of the ground. Artifacts include any man-made object, including glass, nails, bricks, ceramics, arrowheads, metal, and structures such as fence posts and building remnants.
- Construction contractors performing dune and shoreline restoration, and seawall/bulkhead construction will avoid digging, construction, vehicular traffic, or other ground-disturbing activities in the direct vicinity of historic properties listed, eligible or potentially eligible for listing on the NRHP. If digging, construction, vehicular traffic, or other ground-disturbing activities are to occur in such an area, workmen will notify Eglin AFB Cultural Resources 96 CEG/CEVH. The 96 CEG/CEVH will clearly mark or identify those areas listed as eligible or potentially eligible.

6.6 BIOLOGICAL RESOURCES

Terms and Conditions stated in the USFWS BO are the primary biological resource management requirements. The Air Force will comply with these conditions, found on pages 38 - 41 of the BO (Appendix G, Attachment G-2).

6.6.1 USFWS Biological Opinion Terms and Conditions

USFWS Biological Opinion Terms and Conditions for the Proposed Action are as follows:

Proposed Work

- The new and or/repaired storm protection armoring structures or rock toe scour protection at TS A-3, A-11, A-13 and A-13B shall be constructed as close as feasible to the structures they are to protect, but no further than 20 feet seaward of the seaward-most edge of the foundation of the structure.
- The new bulkhead at TS A-3½ shall be located as close as feasible to the new concrete pad.
- All material used for the seawall backfill must be similar to the native beach sand found on SRI. The fill material must be similar in both coloration and grain size distribution to the native beach. All such fill material must be free of construction debris, rocks, or other foreign matter and must not contain, on average, greater than 10 percent fines (i.e., silt and clay) (passing the #200 sieve) and must not contain, on average, greater than 5 percent coarse gravel or cobbles, exclusive of shell material (retained by the #4 sieve).
- All non-biotic storm debris such as asphalt or concrete must be removed from the nesting beach and in other areas where a future storm could redistribute the material onto the nesting beach.
- Upon completion of construction, all construction materials and debris must be removed from the beach. The beach within the work area shall be contoured similar to adjacent beaches outside of the work area.
- The material used for the access road at TS A-3½ shall be material compatible with the coastal environment. The material may be Bahama rock, or a material of comparable color and composition.
- If the repaired or new armoring structures are determined to cause erosion to adjacent sea turtle nesting habitat, appropriate remedial measures shall be undertaken prior to the 2007 sea turtle nesting season (1 May 2007). Remedial measures could include but may not be limited to: removal or relocation of the armoring structure.

Species Protection

- All conservation measures Eglin proposes to avoid or minimize impacts to nesting and hatchling sea turtles shall be implemented.

- The storm protection work may be conducted only during the daytime hours and only during the 2006 and 2007 sea turtle nesting seasons (1 May – 31 October 2006 and 2007).
- All storm protection work occurring from 1 May through 31 October shall wait until the daily sea turtle nest survey and protection (nest marking and/or relocation) are completed.
- If sea turtle nests are laid within 500 feet on either side of the storm protection work areas, the eggs shall be relocated per the following requirements:
  - Eglin Natural Resources or their designee only shall conduct nesting surveys and egg relocations. They must conduct nest surveys daily between sunrise and 9 a.m. They shall perform surveys in such a manner so as to ensure that storm protection work does not occur in any location prior to completion of the necessary sea turtle protection measures.
  - Only those nests that storm protection work may affect shall be relocated. Nests requiring relocation shall be moved no later than 9 a.m. the morning following deposition and as close as feasible to the original nest site and outside the impact of the storm protection work. Nest relocations in association with storm protection work shall cease when work activities no longer threaten nests. Any nests left in the active work zone must be clearly marked, and all mechanical equipment shall avoid nests by at least 10 feet.
  - All relocated sea turtle nests shall be marked. The nest marking may be in the form of a predator-proof cage or other marking in accordance with Eglin's Florida Fish and Wildlife Conservation Commission (FWC) permit and guidelines and conspicuous to military personnel or their contractors.
  - Eglin Natural Resources or their designee shall inspect relocated nest sites daily to assure nest markers remain in place and the nest has not been disturbed.
- All equipment or vehicles shall be removed from the beachfront nightly during the sea turtle nesting season (1 May through 31 October). Stockpiled armoring material or debris that cannot be feasibly removed from the beach shall have a barrier erected around them to prevent the movement of adult or hatchling sea turtles underneath or into the armoring material or debris and becoming entrapped, misoriented, or disoriented. The barrier must be composed of a material, and be at a height and installed so that adult turtles cannot knock down or crawl over the barrier, and hatchlings cannot crawl beneath it.

Species Monitoring

- Daily early morning surveys shall be required if any portion of the storm protection work occurs during the period from 1 May through 31 October in accordance with established State of Florida Index Nesting Beach Survey (INBS) and Eglin Natural Resources protocol. The frequency of hatching and emerging success monitoring after 1 September shall involve checking nests daily until the last nest has either hatched or reached 80 days incubation, at which time the nest will be evaluated per state protocol. Hatching and

emerging success monitoring shall involve checking nests beyond the completion date of the daily early morning nesting surveys.

- Eglin Natural Resources staff or their designee only shall conduct nesting surveys and they must conduct them daily between sunrise and 9 a.m. Data gathered during the survey shall be in the form the FWC permit requires. The survey shall include geographic position data collection and the data shall be incorporated into Eglin's geographic information system.
  - Nests deposited within areas where storm protection work have ceased or will not occur for 80 days must be marked and left *in situ* unless other factors threaten the success of the nest.
  - All sea turtle nests shall be marked. The nest marking may be in the form of a predator-proof cage or other marking in accordance with Eglin's FWC permit and guidelines and conspicuous to military personnel or their contractors. Once a nest is marked, or it is determined that there is no nest, and it is a false crawl, the crawl shall be obliterated so that it is obvious that the site has been checked.
  - Eglin Natural Resources staff or their designee shall inspect nest sites daily to assure nest markers remain in place and the nest has not been disturbed. Eglin's Natural Resources shall document all interactions between sea turtles and storm protection structures, including photographs.
- Eglin shall continue to participate in the State of Florida's Sea Turtle Stranding and Salvage Network. All strandings shall include geographic position data collection and the data shall be incorporated into Eglin's geographic information system.

Habitat Protection, Impact Evaluation, and Restoration and Maintenance

- Eglin shall ensure that beach and dune habitats the storm protection work impacts are appropriately restored and maintained with concurrence from USFWS.
- All ruts resulting from the storm protection work deeper than 3 inches shall be removed prior to sunset at nests that are at incubation day 60 or greater during the 2006 sea turtle nesting season.

Reporting

- Eglin Natural Resources personnel shall be immediately notified upon location of a sea turtle adult, hatchling, or egg that has been harmed or destroyed. Eglin Natural Resources, their designee, or the 24-hour contact shall be responsible for notifying the FWC Sea Turtle Stranding and Salvage Network by Pager: 1-800-241-4653, ID#274-4867; and the USFWS office located in Panama City, Florida at (850) 769-0552. Care should be taken in handling injured turtles or eggs to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials in the best possible state for later analysis.

- A report describing the actions taken to implement the terms and conditions of this incidental take statement must be submitted to the Project Leader, USFWS, 1601 Balboa Avenue, Panama City, Florida, 32405, within 60 days of the end of the 2006 calendar year or the completion of the project. This report shall include the dates of the activities, assessment and action taken to address impacts to sea turtle and their habitats on SRI if they occurred, and hatching and emerging success of nests. If no activities take place, a negative report is still required, with sea turtle nesting survey data for the year. Only if all the activities are cancelled will the above conditions not be required.

6.6.2 Dredging

- The USACE (or their contractor) will trawl the area in front of the dredge continuously to capture sea turtles and sturgeon before they can be entrained or harmed by the dredge. The USACE would release any sturgeon or turtles captured away from the dredge.
- The USACE should conduct the action during the winter months to minimize adverse effects to beach fauna, allow for recruitment of new organisms and foster beach ecology recovery.
- There should be a period of three years between shoreline restoration events to ensure proper recovery of surf zone and beach areas.

6.6.3 Construction

The USACE or their contractor would employ the following procedures to minimize impacts to sensitive species and habitats from seawall, bulkhead, and concrete pad repairs and construction. Note that certain precautions are only necessary during sea turtle season (1 May through 31 October).

- For construction applications that require the use of crushed rock (for example, A-3½ access road), the Air Force will use Bahama rock or a suitable substitute. This type of rock is environmentally compatible with the beach mouse.
- All activity associated with repairs/construction would occur during daytime hours.
- The 96 CEG/CEVSN will conduct nesting surveys 70 days prior to construction/repair activities or by 1 May, whichever is later. Surveys will continue through the end of the project or through 1 September, whichever is earlier. The 96 CEG/CEVSN will check nests beyond the completion date of daily early morning surveys to determine hatching and emergence success.
- Seawalls and bulkheads will be constructed as close to the existing facility as possible.
- Nests will be marked and protected in accordance with established Eglin 96 CEG/CEVSN and state protocol from 1 May through 31 October.
- The 96 CEG/CEVSN will implement a sea turtle nest relocation program in accordance with guidelines of the Section 7 consultation incidental take statement for areas where nests would be at risk.

- All ruts deeper than 2 inches shall be removed prior to sunset during sea turtle hatching season (July to September) at nests that are at incubation day 60 or greater.
- For nests laid within 0.5 mile from the work area the 96 CEG/CEVSN will set a series of stakes and highly visible survey ribbon or string in a 10-foot radius around the nest. No activity would occur within this area, nor would any activity occur that could result in impacts to the nest. The 96 CEG/CEVSN will inspect nests daily to ensure nest markers remain in place and that the nest has not been disturbed.
- Construction/repair activities would not occur within 200 feet of any nest past day 60 incubation regardless of the time of day or night.
- No other equipment, vehicles, etc., would be allowed on the beach or dunes during repair activities that are not essential to the repair activity.
- The 96 CEG/CEVSN shall provide a 24-hour contact to the activities participants that would be available to respond to or handle emergencies related to harm or injury of sea turtles and to answer questions concerning endangered species.
- All personnel involved in performing the work would familiarize themselves with all requirements.
- Designated access corridors from roads to beach would be periodically monitored for invasive species.

6.6.4 Land Mass Restoration

Shoreline Restoration

The 96 CEG/CEVN would employ the avoidance and minimization procedures detailed below to minimize impacts to sensitive species and habitats from shoreline restoration. Note that certain precautions are only necessary during sea turtle season (1 May through 31 October).

- Efforts shall be taken to complete as much of the shoreline restoration activities as possible outside of sea turtle season.
- All known sea turtle nests would be marked and protected in accordance with established Eglin 96 CEG/CEVSN and state protocol from 1 May through 31 October.
- A sea turtle nest relocation program shall be implemented in areas where nests would be at risk.
- 96 CEG/CEVSN would install a series of stakes and reflective tape to establish a 10 foot radius surrounding each sea turtle nest. No activity would occur within this area, nor would any activity occur that could result in impacts to the nest. 96 CEG/CEVSN would inspect nest sites daily to be sure nest markers remain in place and that the nest has not been disturbed.
- 96 CEG/CEVSN would instruct vehicle operators to remain alert at all times to the potential presence of sea turtles on the beach. If a sea turtle was observed on the beach during activities, bulldozers would be turned off and operators would remain quiet,

allowing the turtle to continue her activities. If hatchling turtles were observed on the beach, all activities would cease until the hatchlings reached their destination.

- If a turtle crawl is seen on the beach with no associated marked nest, the 96 CEG/CEVSN or appropriate turtle monitoring personnel shall be contacted immediately. Care shall be taken not to disturb the crawl and/or nest site.
- All ruts deeper than 2 inches shall be removed prior to sunset during sea turtle hatching season (July to September) at nests that are at incubation day 60 or greater.
- Shoreline restoration activities would not occur within 200 feet of any nest past day 60 incubation regardless of the time of day or night.
- The USACE or their contractor would minimize the use of lights during nighttime operations and cover all headlights with the appropriate sea turtle filter material.
- Eglin shall provide a 24-hour contact to the activities participants that would be available to respond to or handle emergencies related to harm or injury of sea turtles and to answer questions concerning endangered species.
- The USACE would conduct a sand source analysis prior to dredging. The analysis would ensure that particle size and color of the sands to be used for shoreline restoration closely matched the beach sands on SRI.
- Immediately following completion of the shoreline restoration project and before the next three nesting seasons, 96 CEG/CEVSN shall monitor beach compaction and the USACE shall conduct tilling as required to decrease the probability of affecting sea turtle nesting and hatching activities.
- Immediately following completion of the shoreline restoration project and before the next three nesting seasons, 96 CEG/CEVSN shall conduct monitoring to determine if escarpments are present, and if present, they shall be leveled as required to decrease the probability of affecting sea turtle nesting activities.
- All personnel involved in performing the work would familiarize themselves with all requirements.

Dune Restoration

The 96 CEG/CEVSN would employ the avoidance and minimization procedures below to minimize impacts to sensitive species and habitats from dune restoration activities. Note that certain precautions are only necessary during sea turtle season (1 May through 31 October).

- The 96 CEG/CEVSN will conduct nesting surveys 70 days prior to restoration activities or by 1 May, whichever is later. Surveys will continue through the end of the project or through 1 September, whichever is earlier. Nests will be checked beyond the completion date of daily early morning surveys to determine hatching and emergence success.
- The 96 CEG/CEVSN shall implement a sea turtle nest relocation program in areas where nests would be at risk.

- If a nest were laid within 0.5 mile from the work area, the 96 CEG/CEVSN would install a series of stakes and highly visible survey ribbon or string to establish a 10 foot radius surrounding the nest. No activity would occur within this area, nor would any activity occur that could result in impacts to the nest. Nest sites would be inspected daily to be sure nest markers remain in place and that the nest has not been disturbed.
- Any sand fencing or other dune restoration material placed in the dune restoration areas must be installed according to the following guidelines. A maximum of 10 foot-long spurs of parallel fence spaced at a minimum of 7 ft apart must be installed on a northeast-southwest (diagonal) alignment. All fence material must be repositioned as necessary to facilitate dune building and must be removed when 30 percent of the fence is covered with sand.
- USACE will use only native plant species for dune vegetation, and planting will follow FDEP guidelines.
- 96 CEG/CEVSN will inspect potted plants for fire ants.
- When possible, the USACE will use plants that originated from Eglin seed or cuttings.
- Only certified weed-free vegetative material (e.g., hay bales, pine straw) would be used if brought in from off the island. The Air Force should receive a guarantee from the supplier stating such.
- USACE or their contractor would avoid activities in piping plover critical habitat, which is marked with "Endangered Species" signs.
- Designated access corridors would be periodically monitored for invasive species.
- All activities would avoid known locations of the perforate lichen, which are fenced off and marked with "Endangered Species" signs.
- Eglin shall provide a 24-hour contact to the activities participants that would be available to respond to or handle emergencies related to harm or injury of sea turtles and to answer questions concerning endangered species.
- Personnel would avoid existing dunes.
- All personnel involved in performing the work would familiarize themselves with all requirements.

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APPENDIX A

SUPPORTING INFORMATION FOR AIR QUALITY

SUPPORTING INFORMATION FOR AIR QUALITY

This appendix presents an overview of the Clean Air Act (CAA) and the state of Florida air quality program. The appendix also discusses emission factor development and calculations including assumptions employed in the air quality analyses.

Air Quality Program Overview

National Ambient Air Quality Standards:

In order to protect public health and welfare, the U.S. Environmental Protection Agency (USEPA) has developed numerical concentration-based standards or National Ambient Air Quality Standards (NAAQS) for six "criteria" pollutants (based on health-related criteria) under the provisions of the CAA Amendments of 1970. There are two kinds of NAAQS: primary and secondary standards. Primary standards prescribe the maximum permissible concentration in the ambient air to protect public health including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards prescribe the maximum concentration or level of air quality required to protect public welfare including protection against decreased visibility, damage to animals, crops, vegetation, and buildings *(40 Code of Federal Regulations [CFR] Part 50).*

The CAA gives states the authority to establish air quality rules and regulations. These rules and regulations must be equivalent to, or more stringent than, the federal program. The Division of Air Resource Management within the Florida Department of Environmental Protection (FDEP) administers the state's air pollution control program under authority of the Florida Air and Water Pollution Control Act and the Environmental Protection Act.

Florida has adopted the NAAQS except for sulfur dioxide (SO_2). USEPA has set the annual and 24-hour standards for SO_2 at 0.03 parts per million (ppm) (80 micrograms per cubic meter [$\mu g/m^3$]) and 0.14 ppm (365 $\mu g/m^3$), respectively. Florida has adopted the more stringent annual and 24-hour standards of 0.02 ppm (60 $\mu g/m^3$) and 0.1 ppm (260 $\mu g/m^3$), respectively. In addition, Florida has adopted the national secondary standard of 0.50 ppm (1,300 $\mu g/m^3$). Federal and state of Florida ambient air quality standards are presented in Table A-1 *(*FAC, 1996*).*

Based on measured ambient air pollutant concentrations, the USEPA designates areas of the U.S. as having air quality better than (attainment) or worse than (nonattainment) the NAAQS and unclassifiable. Those that cannot be classified on the basis of available information as meeting or not meeting the NAAQS for a particular pollutant are "unclassifiable" and are treated as attainment until proven otherwise. Some attainment areas can be further classified as "maintenance" areas. Maintenance areas are those areas previously classified as nonattainment and have successfully reduced air pollutant concentrations below the standard. Maintenance areas are under special maintenance plans and must operate under some of the nonattainment area plans to ensure compliance with the NAAQS. All areas of Florida are in compliance with the NAAQS.

Table A-1. National and State Ambient Air Quality Standards

Criteria Pollutant	Averaging Time	Federal Primary NAAQS[1,2,3]	Federal Secondary NAAQS[1,2,4]	Florida Standards
Carbon Monoxide (CO)	8-hour 1-hour	9 ppm[5] (10 mg/m^3)[6] 35 ppm (40 mg/m^3)	No standard No standard	9 ppm (10 $\mu g/m^3$)[7] 35 ppm (40 $\mu g/m^3$)
Lead (Pb)	Quarterly	1.5 µg/m3	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$
Nitrogen Dioxide (NO_2)	Annual	0.053 ppm (100 $\mu g/m^3$)	0.053 ppm (100 $\mu g/m^3$)	0.053 ppm (100 $\mu g/m^3$)
Ozone (O_3)	1-hour[8] 8-hour[9]	0.12 ppm (235 $\mu g/m^3$) 0.08 ppm (157 $\mu g/m^3$)	0.12 ppm (235 $\mu g/m^3$) 0.08 ppm (157 $\mu g/m^3$)	0.12 ppm (235 $\mu g/m^3$) 0.08 ppm (157 $\mu g/m^3$)
Particulate Matter ≤10 Micrometers (PM_{10})	Annual 24-hour[10]	50 $\mu g/m^3$ 150 $\mu g/m^3$	50 $\mu g/m^3$ 150 $\mu g/m^3$	50 $\mu g/m^3$ 150 $\mu g/m^3$
Particulate Matter ≤2.5 Micrometers ($PM_{2.5}$)	Annual 24-hour[11]	15 $\mu g/m^3$ 65 $\mu g/m^3$	15 $\mu g/m^3$ 65 $\mu g/m^3$	15 $\mu g/m^3$ 65 $\mu g/m^3$
Sulfur Dioxide (SO_2)	Annual 24-hour 3-hour	0.03 ppm (80 $\mu g/m^3$) 0.14 ppm (365 $\mu g/m^3$) No standard	No standard No standard 0.50 ppm (1300 $\mu g/m^3$)	0.02 ppm (60 $\mu g/m^3$) 0.10 ppm (260 $\mu g/m^3$) 0.50 ppm (1300 $\mu g/m^3$)

Source: FDEP, 2000.

1. National standards (other than ozone, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year.
2. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C (degrees Celsius) and a reference pressure of 760 millimeters (mm) of mercury; ppm refers to parts per million by volume.
3. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.
4. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.
5. ppm = parts per million
6. mg/m^3 = milligrams per cubic meter
7. $\mu g/m^3$ = micrograms per cubic meter
8. The ozone one-hour standard still applies to areas that were designated nonattainment when the ozone eight-hour standard was adopted in July 1997. The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than 1 averaged over a three-year period.
9. The 8-hour ozone standard is attained when the 3-year average of the annual fourth-highest daily maximum 8-hour average is not greater than 0.08 ppm.
10. The PM_{10} 24-hour standard is attained when 99 percent of the daily concentrations, averaged over three years, are equal to or less than the standard.
11. The $PM_{2.5}$ 24-hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard.

Each state is required to develop a state implementation plan (SIP) that sets forth how CAA provisions would be imposed within the state. The SIP is the primary means for the implementation, maintenance, and enforcement of the measures needed to attain and maintain the NAAQS within each state and includes control measures, emissions limitations, and other provisions required to attain and maintain the ambient air quality standards. The purpose of the SIP is twofold. First, it must provide a control strategy that would result in the attainment and maintenance of the NAAQS. Second, it must demonstrate that progress is being made in attaining the standards in each nonattainment area.

In attainment areas, major new or modified stationary sources of air emissions on and in the area are subject to Prevention of Significant Deterioration (PSD) review to ensure that these sources are constructed without causing significant adverse deterioration of the clean air in the area. A major new source is defined as one that has the potential to emit any pollutant regulated under the CAA in amounts equal to or exceeding specific major source thresholds: 100 or 250 tons/year based on the source's industrial category. A major modification is a physical change or change in the method of operation at an existing major source that causes a significant "net emissions increase" at that source of any regulated pollutant. Table A-2 provides a tabular listing of the PSD significant emissions rate (SER) thresholds for selected criteria pollutants (USEPA, 1990). (PSD SER and increment thresholds have been established for PM_{10}, but not for $PM_{2.5}$.). It should be noted that mobile source emissions as well as those associated with construction activities are excluded from the PSD applicability process.

The goal of the PSD program is to: 1) ensure economic growth while preserving existing air quality, 2) protect public health and welfare from adverse effects which might occur even at pollutant levels better than the NAAQS, and 3) preserve, protect, and enhance the air quality in areas of special natural recreational, scenic, or historic value, such as national parks and wilderness areas. The CAA requires sources subject to PSD review to obtain a permit before commencing construction. The permit process requires an extensive review of all other major sources within a 50-mile radius and all Class I areas within a 62-mile radius of the facility. Emissions from any new or modified source must be controlled using best available control technology. The air quality, in combination with other PSD sources in the area, must not exceed the maximum allowable incremental increase identified in Table A-3. National parks and wilderness areas are designated as Class I areas, where any appreciable deterioration in air quality is considered significant. Class II areas are those where moderate, well-controlled industrial growth could be permitted. Class III areas allow for greater industrial development.

Table A-2. Criteria Pollutant Significant Emissions Rate Increases Under PSD Regulations

Pollutant	Significant Emissions Rate (tons/year)
PM_{10}	15
Total Suspended Particulate	25
SO_2	40
No_x	40
Ozone (Volatile Organic Compounds [VOC])	40
CO	100

Source: Title 40 CFR Part 50.

Table A-3. Federal Allowable Pollutant Concentration Increases Under PSD Regulations

Pollutant	Averaging Time	Maximum Allowable Concentration (μg/m^3)		
		Class I	Class II	Class III
PM_{10}	Annual	4	17	34
	24-hour	8	30	60
SO_2	Annual	2	20	40
	24-hour	5	91	182
	3-hour	25	512	700
NO_2	Annual	2.5	25	50

Source: Title 40 CFR Part 50.

Florida has a statewide air quality-monitoring network that is operated by both state and local environmental programs (FDEP, 2003). The air quality is monitored for carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide. The monitors tend to be concentrated in areas with the largest population densities and not all pollutants are monitored in those areas. The air quality monitoring network is used to identify areas where the ambient air quality standards are being violated and plans are needed to reduce pollutant concentration levels to be in attainment with the standards; also included are areas where the ambient standards are being met but plans are necessary to ensure maintenance of acceptable levels of air quality in the face of anticipated population or industrial growth.

The end-result of this attainment/maintenance analysis is the development of local and statewide strategies for controlling emissions of criteria air pollutants from stationary and mobile sources. The first step in this process is the annual compilation of the ambient air monitoring results, and the second step is the analysis of the monitoring data for general air quality exceedences of the NAAQS as well as pollutant trends.

The FDEP Northwest District operates and monitors in several northwest counties, including Bay, Escambia, Holmes, Leon, Santa Rosa, and Wakulla counties. Over the years of record there have been exceedences (pollutant concentration greater than the numerical standard) of an NAAQS. However, there has not been a violation (occurrence of more exceedences of the standard than is allowed within a specified time period) of an ambient standard *(*FDEP, 2003). Currently, the state of Florida is attainment for all criteria pollutants.

Regulatory Comparisons

In order to evaluate the air emissions and their impact to the overall region of influence (ROI) the emissions associated with the construction activities were compared to the total emissions on a pollutant-by-pollutant basis for the ROI's 1999 NEI data (USEPA, 1999). Potential impacts to air quality are then identified as the total emissions of any pollutant that equals 10 percent or more of the ROI's emissions for that specific pollutant. The 10 percent criteria approach is used in the General Conformity Rule as an indicator for impact analysis for nonattainment and maintenance areas and although the entire state of Florida is attainment, the General Conformity Rule's impact analysis was utilized to provide a consistent approach to evaluating the impact of construction emissions.

To provide a conservative evaluation, the impacts screening in this analysis, used a more restrictive criteria than required in the General Conformity Rule. Rather than comparing emissions from construction activities to regional inventories (as required in the General Conformity Rule), emissions were compared to the individual counties potentially impacted, which are a smaller area.

PROJECT CALCULATIONS

Combustive Emissions

Combustive emissions are generated as a result of the combustion activities, which occur during engine operations. Unlike highway vehicles, there is no national registration database for non-road vehicles. Therefore, emissions factors are based on correlations and surveys that the USEPA developed over a number of years (Table A-4). Non-road vehicles require a variety of data including the number of vehicles in a fleet, the average engine power (in horsepower) for each type of vehicle and the operation time of the vehicle.

Table A-4. Emission Factors for Non-road Vehicles

Vehicle Class	Emission Factors (g/hr)*				
	CO	NO_X	VOC	SO_X	PM***
Diesel-Powered Vehicles					
Crane	4.20	10.30	1.30	0.93	1.44
Excavator	5.20	10.75	0.70	0.93	1.44
Grader	3.80	9.60	1.60	0.87	1.00
Off-Highway Truck	2.90	9.60	0.86	0.89	0.80
Other Construction Equipment	9.20	11.01	1.40	0.93	1.44
Other General Industrial Equipment	6.06	14.00	1.60	0.93	1.60
Scraper	5.00	8.70	0.70	0.90	1.26
Tractor/Loader/Backhoe	6.80	10.10	1.40	0.85	1.05
Trencher	9.14	10.02	1.60	0.93	1.44
Paving Equipment**	4.60	11.01	1.00	0.93	0.90
Roller**	3.10	9.30	0.80	1.00	0.78
Other Gen. Ind. Equipment**	158.7	5.2	38.8	0.21	0.1
Roller**	383.8	2.1	22.9	0.22	0.2
Tractor/Loader/Backhoe**	257.4	4.8	105.4	0.16	0.1

Source: USEPA 1991

** Emission factors in grams per horsepower per hour (g/hp-hr)

*** Indicates total particulate matter, not only PM_{10}.

Combustive emissions from the construction vehicles were calculated using non-road vehicle emissions factors, specifically heavy-duty equipment. The following equation was used to calculate emissions from the construction activities:

$$\text{Emissions} = POP * A * EF * CF$$

Where:

Emissions = Non-road Vehicle Emissions (lbs)
POP = Engine population (i.e., number of vehicles)
A = Activity (hrs/year)
EF = Emission Factor (g/hr)
CF = .002205 conversion Factor (g to lbs)

Two conservative assumptions were made for the analysis. First, it was assumed that the vehicle fleet consisted of four bulldozers with a 500 horsepower (hp) engine, two small emplacement excavators that utilized a 110 hp engine, three 5 kilowatt generators operating at 7 hp, and one dredge ship operating four 600 hp diesel engines. Calculations were based on construction activities occurring twenty-four hours a day for all equipment types in the fleet for five months continuously.

Secondly, the emission factor chosen for use in emissions calculations were either from "Other Construction Equipment" or "Other General Industrial Equipment" vehicle classes. The highest factor of these two vehicle classes was used in the analysis to add to the conservative analysis approach.

National Emissions Inventory

The National Emissions Inventory (NEI) is operated under USEPA's Emission Factor and Inventory Group, which prepare the national database of air emissions information with input from numerous state and local air agencies, and from tribes, as well as from industry. The database contains information on stationary and mobile sources that emit criteria air pollutants and hazardous air pollutants (HAPs). The database includes estimates of annual emissions, by source, of air pollutants in each area of the country on an annual basis. The NEI includes emission estimates for all 50 States, the District of Columbia, Puerto Rico, and the Virgin Islands. Emission estimates for individual point or major sources (facilities), as well as county level estimates for area, mobile, and other sources, are currently available for years 1996 and1999 for criteria pollutants and HAPs.

Criteria air pollutants are those for which USEPA has set health-based standards. Four of the six criteria pollutants are included in the NEI database:

- Carbon Monoxide (CO)
- Nitrogen Oxides ($NO_{x)}$
- Sulfur Dioxide (SO_2)
- Particulate Matter (PM_{10} and $PM_{2.5}$)

The NEI also includes emissions of VOCs, which are ozone precursors, emitted from motor vehicle fuel distribution and chemical manufacturing as well as other solvent uses. VOCs react with nitrogen oxides in the atmosphere to form ozone. The NEI database defines three classes of criteria air pollutant sources:

- Point sources - stationary sources of emissions, such as an electric power plant, that can be identified by name and location. A "major" source emits a threshold amount (or more) of at least one criteria pollutant, and must be inventoried and reported. Many states also inventory and report stationary sources that emit amounts below the thresholds for each pollutant.
- Area sources - small point sources such as a home or office building, or a diffuse stationary source, such as wildfires or agricultural tilling. These sources do not individually produce sufficient emissions to qualify as point sources. Dry cleaners are one example, i.e., a single dry cleaner within an inventory area typically will not qualify as a point source, but collectively the emissions from all of the dry cleaning facilities in the inventory area may be significant and therefore must be included in the inventory.
- Mobile sources - any kind of vehicle or equipment with a gasoline or diesel engine; airplane; or ship.

The main sources of criteria pollutant emissions data for the NEI are:

- For electric generating units - USEPA's Emission Tracking System / Continuous Emissions Monitoring Data and Department of Energy fuel use data.
- For other large stationary sources - state data and older inventories where state data was not submitted.
- For on-road mobile sources - the Federal Highway Administration's estimate of vehicle miles traveled and emission factors from USEPA's MOBILE Model.
- For non-road mobile sources - USEPA's NONROAD Model.
- For stationary area sources - state data, USEPA-developed estimates for some sources, and older inventories where state or USEPA data was not submitted.
- State and local environmental agencies supply most of the point source data. USEPA's Clean Air Market program supplies emissions data for electric power plants.

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APPENDIX B

SUPPORTING INFORMATION FOR SOIL AND SEDIMENT RESOURCES

SUPPORTING INFORMATION FOR SOIL AND SEDIMENT RESOURCES

Santa Rosa Island Soils and Landforms

Formation of SRI occurred within the last 6,000 years as eroding sediments from the east were deposited by currents (littoral drift) and wave action to form a ridge of sand parallel to the mainland (Wolfe and Reidenauer, 1988). Littoral drift and storm erosion currently influence both sides of the Island's physical development, supplying sand from Choctawhatchee Bay and the continental shelf (Wolfe and Reidenauer, 1988). Erosion of island dunes furnishes additional littoral drift sediments.

Weaker littoral drift processes at work on the north side of the Island, through the Santa Rosa Sound, transport finer sediments than those that formed the south beaches. These fine sediments form tidal flats, which lead to the development of coastal marshes. Wind-blown dune deposits have also led to the formation of sandy beaches along the north shore.

Muck depressions are sink areas comprised of hydric soils with an organic surface that overlies sandy marine sediments. Sand depressions are sink areas comprised of hydric soils that are sandy throughout their profile. Sand depressions differ from muck depressions in that they generally do not have an organic muck surface.

Soil Classification

Table B-1 lists descriptions and acreages of the different types of SRI soils.

Table B-1. Santa Rosa Island Soil Descriptions

Soil Series	Area (acres)	Description
Arents	15	Arents are excessively drained, gently sloping soils that were created from the excavation and deposition of fine sandy materials on barrier island land areas. This soil frequently contains subsoil materials from other soil series such as Hurricane, Leon, Foxworth, and Rutlege. As a consequence of deposition, these soils do not have orderly sequence of naturally occurring soil horizons. The soil typically has very low available water capacity and organic matter content.
Beaches	337	Beaches are the narrow corridors of tide washed sands along the shorelines that are commonly free of vegetation. In some instances, sea oats (*uniola paniculata*) may occupy the edges of the beach interior. Beach areas may range from 200 to 500 feet in width. Tide influences and wave actions impact beach areas on a daily basis. Storm events frequently change the configurations and morphology of beaches. Generally beaches have a uniform gentle slope that may transition to a shorter, stronger slope at the waters edge.

Table B-1. Santa Rosa Island Soil Descriptions Cont'd

Soil Series	Area (acres)	Description
Duckston Sand	27	The Duckston Sand series consists of poorly drained sands near the coast. The soil formed in sandy sediments reworked by waves and wind. These soils are in shallow depressions between coastal dunes and on nearly level flats between the dunes and the marshes generally at elevations less than 5 feet above mean tide level. Slopes are typically less than 2 percent and surfaces are plane to concave. The soils are periodically flooded with salt water; salinity is variable according to length of time since last flooding. Runoff is very slow and the soil has very rapid permeability above the water table. The water table fluctuates in relation to the tides and the surface is flooded following heavy rains or high storm tides. Small calcareous shell fragments and slight to strong sulfur odors are present in subsurface horizons of some pedons.
Dorovan Muck	1,727	The Dorovan Muck series consists of deep, very poorly drained, moderately permeable soils on flood plains, swamps, depressions, and swales of the Coastal Plains. They formed from the decomposition of woody and herbaceous plant materials; the organic layers range from 51 to more than 80 inches thick. Slopes range from 0 to 2 percent but are normally less than 1 percent. Runoff is very slow and water is ponded on the surface in depressions. The soil is saturated to the surface most of the time. The underlying mineral sediments commonly are loamy or sandy and are very strongly acid or strongly acid.
Newhan-Corolla Complex	3,548	The Newhan-Corolla Complex consists of excessively and moderately well drained, very rapidly permeable soils formed from sands deposited by wind and water. These soils are on gently undulating dunes commonly near beaches and waterways along the coast. Slopes are commonly 1 to 8 percent but range from 0 to 30 percent. The soil consists of sand and shell fragments deposited mainly by wind along the Atlantic Coast. However, some areas are a result of dredge spoil material. Generally runoff is slow. Calcareous shell fragments mostly of sand size make up to 35 percent of the soil by volume. The soil contains few to common grains of dark minerals. Silt plus clay in the 10-to 40-inch soil layer is generally less than 5 percent.
Null	42	Land or water features that were not surveyed.
Rutlege Sand	13	The Rutlege series consists of very deep, very poorly drained soils with rapid permeability formed in sandy unconsolidated Coastal Plain sediments of marine origin. The Rutlege soils are on upland flats, flood plains, or depressions with planar or convex surfaces. They are also in depressions such as bays, basins, or sinks. The water table is near the surface for long periods of the year and ponding is common in depressional areas. Runoff is ponded or very slow. Silt plus clay in the 10- to 40- inch soil layer averages 5 to 15 percent. The soil is extremely acid to strongly acid throughout, unless it has been limed. Slopes range from 0 to 2 percent.
Urbanland	1	Soil areas that have been impacted by construction and development. Native soils have been covered by buildings, parking lots, or other features and heavily disturbed, buried, or otherwise modified.
Total	**5,710**	

Notes:

Complex – A soil complex is a soil mapping unit that contains two or more soil series with complex soil patterns and intermingling that prevents soil differentiation at the selected mapping scale.

Sources: Weeks, et al., 1980; Overing and Watts, 1989; and Overing et al., 1995

Human interaction with the environment inevitably results in disturbance of the land. Aside from geologic hazards and catastrophic weather events, natural landscapes left undisturbed generally trend toward a dynamic equilibrium that results in limited or minimal soil disturbances. Human-induced land disturbance activities may create geomorphic disequilibria that degrade soil environments and increase soil erosion potentials. Some disturbances may be minor or transitory, allowing the landscape to reclaim productivity, while other disturbances may be characterized as ecosystem altering events (Toy and Hadley, 1987).

Soil Trafficking

Soil trafficking is the exertion of pressure on the soil surface through the tracks and/or wheels of land vehicles. The ability of a soil to carry a certain load depends on a number of characteristics of the soil and the soil water content. Generally, under dry conditions, sandy soils have lower trafficability than clayey soils. All soils become less trafficable as soil moisture content increases (Arnup, 1998).

Heavy equipment, vehicles, and even foot traffic can leave a long-lasting legacy of compacted soils and ruts that can have dramatic impacts on the environment. The risk of soil compaction from trafficking depends on the intensity of traffic (number of passes), weight of the vehicle, tire/track pressure, soil type, ground cover, and soil properties, particularly soil moisture content and texture. Soil rutting primarily occurs as a result of the operation of heavy vehicles on wet soils.

The weight of the vehicle or equipment generally determines the degree of subsoil compaction. Heavier vehicles tend to cause deeper, longer lasting compaction. Most compaction occurs during the first few passes with subsequent trips having limited impact. Generally, compaction is greatest at points with the most passes (King and Haines, 1979). Compaction is most critical on clay and loamy soils that have been disturbed when wet, but compaction can also adversely impact the soil structure of sandy soils, particularly sandy soil with a fine sand texture.

The activity of greatest potential consequence to the Island's soil environment is bulldozing. Bulldozers are tracked heavy equipment vehicles that are used to gather and move soil materials to desired locations. Bulldozers are powerful crawler type tractors that are equipped with a front mounted dozer blade. Bulldozers can disturb the existing soil matrix and exert extensive pressure on the soil surface. As an example, a Caterpillar D9 bulldozer, which is commonly used for large earth moving projects, weights approximately 107,550 pounds (54 tons) (Figure B-1).

For future possible beach restoration, the USACE or their contractor would deposit approximately 4 million cubic yards of sediments dredged from the Gulf on to the Island and distribute it with bulldozers to rebuild the Island's eroded beaches and historic sand dune systems (Figures 5-1 and 5-2). Bulldozer operations will occur along approximately 17 miles of the Island during shoreline restoration and at 23 dune reconstruction sites (refer back to Figure 2-1 through 2-5). These types of earth moving activities are executed by multiple trips of bulldozers as surface contours and features are gradually rebuilt to design specifications. To avoid wet soil impacts, all trafficking from bulldozers and other vehicles will be excluded from wetland areas.

Figure B-1. Caterpillar D9 Bulldozer

Bulldozing may physically alter soils. Changes to the soil environment may include increased shear strength, bulk density, and soil moisture content and altered silt/clay content (Greene, 2002). The Air Force does not anticipate any significant soil contamination from bulldozer operation caused by hydraulic fluid, fuel or engine oil.

Liddle and Greig-Smith (1975) conducted an investigation of coastal dune system soil disturbance and found that soil bulk density and penetration resistance were significantly higher under vehicle tracks compared to undisturbed soils under vegetation in adjacent areas. The degree of soil compaction within the study area varied with depth; the maximum compression of the soil occurred between 15 and 35 centimeters below the surface and soil compaction extended to a depth of at least 48 centimeters. Sandy soil compression was sufficient to reduce pore space and produce anaerobic soil conditions, increase the water content of dry dune soils, and reduce soil air space, which could hinder diffusion and restrict soil respiration rates. The potential benefit to native vegetation of increased soil water content during dry periods is likely offset by subsurface anaerobic soil conditions and restricted soil root penetration caused by increased soil bulk density.

Hosier and Eaton (1980) studied vehicle traffic on the Cape Fear barrier island in North Carolina and found that near surface (1 centimeter depth) soil penetration resistance was twice as high in non-trafficked dune areas than areas impacted by vehicles. At 15 centimeters soil penetration resistance was 2.42 times higher in the vehicle-impacted areas than in the undisturbed areas.

Soil trafficking not only affects the soil environment but also can dramatically affect site microclimate parameters and plant cover. During a study of the Padre Island, Texas dune systems, McAtee and Drawe (1981) found that as the intensity of vehicular and pedestrian traffic increased, average wind velocities near the surface, evaporation, near surface atmospheric salinity, wind-carried sand particles near the surface, soil salinity, soil pH, average soil temperature and range in temperature, soil bulk density, and soil-water content increased.

Soil Physical Damage

Soil physical damage caused by surface disturbances may be categorized as displacement, exposure of mineral soil, compaction, rutting, erosion, mass wasting, nutrient depletion, microclimate changes, and hydrologic changes. Soils are most susceptible and least resistant to the effects of soil disturbance under wet conditions (Scheerer et al., 1994). Soil trafficking under wet conditions can result in considerable soil compaction and alter subsurface hydrology by increasing seasonally high water table levels (Sun et al., 2001). Key indicators of physical soil degradation include soil texture, bulk density, aggregate stability and size distribution, and water-holding capacity. The extent to which land use and management activities affects long-term soil productivity depends on the type of soil, climatic conditions, and intensity of the activity.

The physical damage of soils from heavy equipment trafficking is dependent on a number of site-specific conditions, but is typically most profound during wet periods. As presented in the previous sections, the emphasis of this data analysis is generally defined by soil properties and seasonal high water table variables that estimate periods when soils are typically most vulnerable to soil trafficking damage. However it is important to note that all soils are vulnerable to varying degrees of damage when wet. The types of soil disturbance evaluated for this analysis, including soil compaction and soil rutting, are defined and described below.

Soil Compaction

Soil compaction occurs when physical forces are exerted on a soil matrix forcing individual soil particles to rearrange into close proximity. As a consequence of soil particle rearrangement, there is typically a reduction in the amount and size of total soil volume pore space, which can lead to decreased soil infiltration capacity, increased surface runoff, standing water, and erosion. This type of change to the soil environment can lead to site degradation and may have detrimental effects on vegetation, hydrology, and soil resources. Compaction of natural soils can significantly decrease plant production (Busscher et al., 1995; Unger and Kaspar, 1994; Brown et al., 1992; Logsdon et al., 1992; Douglas et al., 1992) by limiting access to water and nutrients, restricting root development, and reducing soil aeration.

Sandy soils have proportionally high bulk densities (1.2 to 1.8 grams per cubic centimeter (g/cm^3) or 75 to 110 pounds per cubic feet [lbs/ft^3]) while silts and clays normally range from 1.0 to 1.6 g/cm^3 or 65 to 100 lbs/ft^3 (Unger and Kaspar, 1994). Under comparable conditions, silt and clay soils generally compact more severely than sandy soils. Soils with low levels of organic matter are generally more susceptible to soil compaction, whereas soils with higher levels of organic matter are more difficult to compact.

Soil Rutting

Depending on their pattern and orientation, ruts can alter surface drainage, particularly sheet flows, and may also increase soil erosion potentials. Under wet soil conditions, silts and clays are more prone to rutting than sandy soils. Organic soils are highly susceptible to rutting (Arnup, 1998). As soils become saturated, compaction potentials generally decrease and rutting

potentials increase (Coder, 2000; Arnup, 1998). Rutting is also influenced by slope, vegetation type, and ground cover. Natural recovery of soils to pre-compaction and pre-rutting conditions is extremely slow, if it occurs at all. Recovery of sandy soils is very slow and compacted subsurface layers take much longer to recover.

Soil Resource Impact Potentials

Based on a review of the proposed bulldozer soil trafficking and estimated characteristics of the existing soil resources (Section 3.3 and Table B-1), varying degrees of soil damage will occur as a result of the proposed shoreline and dune restoration. A prominent characteristic of the proposed beach and dune building is the concentrated, repetitious movements of heavy bulldozers, which can dramatically increase soil compaction potentials. The subsequent compaction of impacted Island soils could be severe (maximum levels of compaction are likely to occur) and result in dynamic changes to the Island ecosystem.

Since the Air Force will restrict trafficking from all wetland areas and SRI soils are naturally low in organic matter, clay, and silt materials, limited soil rutting would occur. Based on the description of activities, the Air Force expects that soil disturbance associated with proposed concrete pad, bulkhead, and seawall repair and construction will be localized and have minimal impacts on Island soil resources. However, it is important to note that any structure which disrupts the transport of sand either long-shore or vertically on-off shore may cause severe erosion. As an example, a study by Miles et al. (2001) found that coastal seawall structures in south Devon, United Kingdom significantly altered sediment suspension and transport processes in comparison to adjacent natural beach areas. Suspended sediment concentrations were higher, onshore sediment transport was reduced, and longshore transport was on order of magnitude higher in front of the wall.

Table B-2 summarizes soil trafficking variables instrumental in determining the susceptibility of Island soil resources to physical damage from dune restoration. Soil-vehicle ground pressure evaluation was not conducted as a part of this analysis.

Physical soil degradation by trafficking is dependent on a number of site-specific conditions, but is typically most profound during wet periods. Periods of soil wetness generally follow seasonal trends, however, SRI occurs in a part of Florida where heavy and prolonged rainfall events that extend wet periods beyond normal seasonal trends can be quite common. Bulldozing activities during or following heavy rainfall could extend the duration of potential impacts and make all soils severely to highly susceptible to soil compaction damage.

The estimated properties of the non-hydric island soils that contribute to soil compaction potentials include fine sand texture, low levels of soil organic matter, and relatively shallow seasonal high water table (SHWT) events (Section 3.2). Soil resource impact determination estimations are based on an understanding that these soil features are highly variable and may exhibit significant localized fluctuations.

Table B-2. Soil Trafficking Impact Potentials

Variable Description	Impact Description	Impact Susceptibility[a]	Analysis Metric	
			Footprint Description	Impact Footprint
Shoreline Restoration – Two to four bulldozers will work continuously over the course of four to five months to rebuild approximately 9 miles of beaches using 3.2 million cubic yards of dredged sand.	Repetitious tracking by heavy bulldozers over the same area exerts extensive pressure on the soil surface resulting in a rearrangement of soil particles and increase in bulk density.	Subsurface Soil Compaction	Land area (acres) within the construction footprint likely to exhibit the most severe soil damage.	150 foot wide beach construction area on 17 miles of beach
Dune Reconstruction – Bulldozers will be used to relocate approximately 800,000 cubic yards of dredged sediments to rebuild sand dunes at 23 locations on the Island.				100 foot wide high impact zone adjacent to constructed dune slope toe

[a] It is assumed that bulldozing construction activities would occur during periods of seasonal high water tables and wet periods and the maximum depth of compacted soil layers would be less than two feet.

Soil Damage Recovery

Island soils damaged by compaction will not readily recover to predisturbance conditions without intervention. The term intervention implies the implementation of actions that physically mitigate the condition of disturbed soils. In the absence of intervention, soil recovery process may take several decades. Alleviation of compacted soil layers will require the use of specialized tillage implements that are pulled through the compacted soil layers. Tillage implements typically used to alleviate subsurface soil compaction include chisel plows, rotary tillers, subsoilers, and rippers (Figure B-2). The type of tillage implement required to alleviate compressed soils primarily depends on the depth and density of the compacted layer(s). Vibrating subsoils can be used for improved soil fracturing. Soil penetrometers should be used to test post-construction impact zones to define the characteristics of the compacted soil layers prior to implementing soil recovery or other ecosystem mitigations (Leung and Meyer, 2004).

Subsoiler

Ripper

Figure B-2. Bulldozer Tillage Implements

Marine Physiography and Geology

The Gulf of Mexico is a restricted oceanic basin, nearly surrounded by the United States, Mexico and Cuba. The Gulf is characterized by a shallow and, in places, broad continental shelf, steep slopes leading from the shelf, two large abyssal plains, and scattered regions of slightly elevated topography (Weber et al., 1992). The average depth is approximately 1,500 meters (m) while depths in the abyssal plains exceed 3,600 m.

Pequegnat (1983) identified the major physiographic provinces of the Gulf as the continental shelf, continental slope, the continental rise, and the abyssal plain. Within the eastern Gulf, specific bathymetric features and regions include the Mississippi-Alabama Shelf, the West Florida Shelf, the DeSoto Canyon, the Florida Middle Ground, the Upper Continental Slope, the Florida Escarpment, the Lower Mississippi Fan, and the Florida and Sigsbee (abyssal) Plains (Peguegnat 1983).

The continental margin of the Gulf is separated into two parts, the Gulf Coast Geosyncline, east of Cape San Blas, and the West Florida margin; the focus of this section. The surface of the West Florida margin, also referred to as the Inner Continental Shelf, is known as the Mississippi-Alabama-Florida (MAFLA) Sand Sheet. It is primarily composed of a patchy veneer of shell debris, foraminifera, and algal and oolitic sands. This sand sheet extends westward to the Mississippi delta. The West Florida Margin, comprised of Jurassic Age carbonate and evaporate rocks, lies beneath this area. Clay mineralogy of the MAFLA and West Florida margin are

dominated by smectite and kaolinite (Dames & Moore, 1979). Hard bottoms, geological and biological formations, are dispersed throughout certain areas of the shelf.

The MAFLA shelf extends from the southern Louisiana waters of the Chandeleur Islands eastward to Cape San Blas and southward to DeSoto Canyon, a moderately sloped submarine valley. The shelf runs roughly parallel with the Florida panhandle, breaking sharply southward at about 30°N Latitude. Geological features of the MAFLA shelf include linear ridges, pinnacles, wave fields, spaced ridges, boulder fields, areas of patchy and extensive hard bottoms, and low to moderate topographic features. The slope off of this shelf is relatively steep at the edge of the shelf (1^{o}), but lessens at approximately 400 m (Pequegnat et al, 1983). Profiler records suggest the shelf edge has been built upon delta-front forest beds, which during the Pleistocene were eroded at a time of low sea level. The surface of the region is capped with Holocene sediments 0-15 m thick.

The development off SRI occurred during the late Holocene (within the last 6,000 years) as eroding sediments from the east were deposited by currents (littoral drift). Littoral drift and storm erosion currently influence both sides of the islands physical development, supplying sand from Choctawhatchee Bay and the continental shelf (Wolfe and Reidenauer, 1988). Erosion of island dunes furnishes additional littoral drift sediments.

The Island has been described as a barrier island complex, having the typical landforms of beaches, coastal dunes, interior dunes, and low-lying soundside beaches and marshes (Chafin and Schotz, 1995). Gulf beaches vary in width, and are relatively flat with gentle slopes. Beach sands vary from unsorted, mixed grain sizes and shells at the surf zone to finely graded and well-sorted grains on dunes. The coarse deposits found on the Gulf side are well oxygenated due to tidal flushing and large interstitial (between sand grains) spaces (Wolfe and Reidenauer, 1988).

Due to recent hurricane activity, morphological changes to the barrier island have occurred by an erosion-deposition process that moved sediments from one side of the island to the other. In addition, there has been a significant coarsening of the beach sand component. These, in turn, affect the offshore sediment since the onshore sediment is transported offshore during wave activity.

Glossary of Terms for Soil Discussion

Soil Series – A grouping of soils into a classification that signifies, with the exception of differences in surface texture(s), distinct similarities in soil profiles and the thickness, composition, and arrangement of soil layers (horizon).

Surface Material – The surface soil material or predominate soil texture (relative proportions of sand, silt, and clay particles in a soil mass).

Hydric Soil – A hydric soil is a soil formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. These soils are typically anaerobic (lacking oxygen) because of frequent durations of water saturation, inundation, or both for periods that exceed a few days.

Soil Depth – Soil depth is generally the thickness of a typical soil pedon (smallest volume that can be called a soil) measured in inches from the soil surface.

Slope – The inclination of the land surface from the horizontal that is measured in percent or degrees.

Permeability – The quality of a soil that allows water to move downward through the soil profile. Permeability is measured as the number of inches per hour that water moves downward through a saturated soil. Terms used to describe permeability include: Moderately Slow – 0.2 to 0.6 inches/hour; Moderate – 0.6 to 2.0 inches/hour; Moderately Rapid – 2.0 to 6.0 inches/hour; Rapid – 6.0 to 20 inches/hour; Very Rapid – more than 20 inches/hour

Water Table - The water table is generally defined as the upper surface of the saturated zone. Fluctuations of the water table over time are highly dependent on the balance between rainfall and evapotranspiration; lateral and subsurface drainage exhibit a somewhat limited role. Soil water tables are extremely dynamic features and exhibit wide and diverse fluctuations. Seasonal fluctuations within some soils may exceed several feet. Generally well-drained soils have shorter periods of high water table levels and longer periods of low water table levels than poorly drained soils. The seasonal high water table is the shallowest depth to free water that stands in an unlined borehole or where the soil moisture tension is zero for more than a few weeks. Generally the water table tends to move in the direction of maximum slope.

Sand – A sort of sand particle that contains a relatively even distribution of coarse, medium, and fine grades of sand gains.

Coarse Sand – Sandy soil that contains 25 percent or more of very coarse and coarse sand and less than 50 percent of any other grade of sand.

Fine Sand – Sandy soil dominated by fine grades of sand that must contain 50 percent or more of fine sand or less that 25 percent very coarse, coarse, and medium sand and less than 50 percent very fine sand.

Mucky Peat – Organic layer composed of partially decomposed moss, leaves, roots, and stems.

Loamy Fine Sand – Sandy soil that contains 50 percent or more fine sand or less than 50 percent very fine sand and less than 25 percent very coarse, coarse, and medium sand.

Apparent Water Table – A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Source: Overing and Watts, 1989

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APPENDIX C

SUPPORTING INFORMATION FOR CULTURAL RESOURCES

Supporting Information for Cultural Resources

C.1 Terrestrial Cultural Resources

Archeological and historic sites located within the Project Area are listed in Tables C-1 and C-2.

Table C-1. Archaeological Sites Located in Project Area

Site Number	Site Type	Site Condition	NRHP Status	Test Area
8OK00005	Unidentified	Unknown	Indeterminate	-
8OK00031	Unidentified	Unknown	Indeterminate	-
8OK00033	Unidentified Prehistoric (Hollow Hill site)	Unknown	Eligible	-
8OK00061	Unidentified	Unknown	Indeterminate	-
8OK00067	Unidentified	Unknown	Indeterminate	-
8OK00126	Unidentified	Unknown	Indeterminate	-
8OK00133	Unidentified	Unknown	Indeterminate	-
8OK00134	Unidentified	Unknown	Indeterminate	-
8OK00150	Multicomponent Prehistoric	Destroyed	Ineligible	-
8OK00151	Multicomponent Prehistoric	Unknown	Eligible	A-10
8OK00152	Prehistoric Component	Unknown	Eligible	-
8OK00153	Multicomponent Prehistoric	Unknown	Eligible	-
8OK00174	Prehistoric Component	Unknown	Eligible	-
8OK00175	Prehistoric/20th Century Military Components	Unknown	Eligible	-
8OK00176	Multicomponent Prehistoric	Unknown	Eligible	-
8OK00182	Prehistoric Component	Unknown	Eligible	-
8OK00193	Prehistoric Component	Unknown	Potentially Eligible	-
8OK00199	Unidentified Historic	Destroyed	Ineligible	-
8OK00211	Unidentified Historic	Moderate damage	Ineligible	-
8OK00218	20th Century Historic Component	Unknown	Ineligible	-
8OK00219	19th and 20th Century Historic	Unknown	Ineligible	-
8OK00220	Historic Isolate	Moderate damage	Ineligible	-
8OK00221	Prehistoric Component	Unknown	Potentially Eligible	-
8OK00222	20th Century Historic Component	Minor damage	Ineligible	-
8OK00223	Prehistoric Isolate	Minor damage	Ineligible	-
8OK00224	Prehistoric Isolate/Historic	Minor damage	Ineligible	-
8OK00225	20th Century Historic Isolate	Major damage	Ineligible	-
8OK00226	20th Century Historic Isolate	Minor damage	Ineligible	-
8OK00227	Prehistoric Isolate	Moderate damage	Ineligible	-
8OK00231	20th Century Historic Isolate	Major damage	Ineligible	-
8OK00238	19th and 20th Century Historic	Minor damage	Ineligible	-
8OK00240	19th and 20th Century Historic	Redeposited	Ineligible	-
8OK00241	Prehistoric Component	Unknown	Eligible	-
8OK00242	Unidentified Historic	Unknown	Ineligible	-
8OK00243	Prehistoric Component	Unknown	Ineligible	-
8OK00244	Prehistoric Component	Unknown	Ineligible	-

Table C-1. Archaeological Sites Located in Project Area Cont'd

Site Number	Site Type	Site Condition	NRHP Status	Test Area
8OK00245	Prehistoric Component	Unknown	Potentially Eligible	-
8OK00246	WWII JB2 Launch Facility	Unknown	Review	-
8OK00247	Prehistoric/ 20th Century Historic Components	Unknown	Ineligible	-
8OK00248	WWII JB2 Launch Facility	Unknown	Review	-
8OK00249	Prehistoric/ 20th Century Historic Components	Minor damage	Ineligible	-
8OK00380	Unidentified	Unknown	Indeterminate	-
8OK00406	Unidentified Prehistoric	Unknown	Ineligible	-
8OK00410	Unidentified Historic	Major damage	Ineligible	A-3
8OK00438	Unidentified Historic	Moderate damage	Ineligible	-
8OK00458	Unidentified Historic	Moderate damage	Ineligible	-
8OK00459	Historic Isolate	Moderate damage	Ineligible	-
8OK00460	Unidentified Historic	Moderate damage	Ineligible	-
8OK00461	Prehistoric Isolate	Moderate damage	Ineligible	-
8OK00469	Unidentified Historic	Moderate damage	Ineligible	-
8OK00471	Historic Isolate	Minor damage	Ineligible	-
8OK01907	Unidentified Prehistoric	Major damage	Ineligible	-
8OK01908	Unidentified Prehistoric	Unknown	Ineligible	-
8OK01909	Prehistoric Component	Unknown	Eligible	-
8OK02112	Prehistoric Component	Unknown	Ineligible	-
8OK02113	Prehistoric/19th and 20th Century Historic Components	Unknown	Ineligible	-
8OK02114	Prehistoric Component	Unknown	Ineligible	-
8OK02115	Unidentified Prehistoric	Unknown	Ineligible	-
8OK02118	Unidentified Prehistoric/20th Century Historic Components	Unknown	Eligible	A-11A
8OK02119	Unidentified Prehistoric/20th Century Historic Components	Unknown	Ineligible	A-11A
8OK02120	Unidentified Prehistoric	Unknown	Eligible	A-11A
8OK02121	Unidentified Prehistoric	Unknown	Ineligible	-
8OK02122	Unidentified Prehistoric	Minor damage	Ineligible	-
8OK02123	20th Century Historic Component	Minor damage	Ineligible	-
8OK02124	20th Century Military Component	Unknown	Ineligible	-
8OK02125	19th and 20th Century Historic	Minor damage	Ineligible	-
8OK02126	Unidentified Prehistoric/Unidentified Historic Components	Minor damage	Ineligible	-
8OK02129	Prehistoric Component	Redeposited	Ineligible	-
8OK02130	Unidentified Prehistoric	Unknown	Ineligible	-
8OK02131	Prehistoric Component	Major damage	Ineligible	-
8OK02239	Unidentified Prehistoric	Unknown	Potentially Eligible	-
8OK02241	Unidentified Prehistoric	Unknown	Ineligible	-
8OK02243	Unidentified Prehistoric/20th Century Historic Components	Minor damage	Ineligible	-
8OK02244	20th Century Military Component	Major damage	Ineligible	-

Table C-1. Archaeological Sites Located in Project Area Cont'd

Site Number	Site Type	Site Condition	NRHP Status	Test Area
8OK02245	20th Century Historic Component	Minor damage	Ineligible	-
8OK02246	20th Century Historic Component	Unknown	Ineligible	-
8OK02331	20th Century Military Component	Unknown	Potentially Eligible	-
8OK02332	20th Century Military Component	Unknown	Ineligible	-
8OK02334	20th Century Military Component	Unknown	Ineligible	-
8OK02336	20th Century Military Component	Unknown	Potentially Eligible	-
8OK02337	Prehistoric Component	Unknown	Potentially Eligible	-
8OK02338	Prehistoric/20th Century Historic Components	Unknown	Potentially Eligible	-
8OK02339	Prehistoric/20th Century Historic Components	Unknown	Ineligible	-
8OK02340	unidentified shipwreck	Unknown	Potentially Eligible	-
8OK02341	20th Century Military Component	Unknown	Potentially Eligible	A-7
8OK02342	Unidentified Prehistoric	Unknown	Potentially Eligible	-
8SR00345	Historic Isolate	Unknown	Ineligible	-
8SR01670	20th Century Historic Component	Minor damage	Ineligible	-
8SR01671	20th Century Military Component	Minor damage	Potentially Eligible	-

Table C-2. Historic Structures Recorded Within Project Area

Site Number	Site Name	Period	NRHP Status	Test Area	Year Built	Comment
8OK01921 /#4985	Radar Maintenance Shop/ Paved Incline Facility	Cold War	Potential	A-4A	1955	Evaluation needs to be examined.
8OK01431 /#8317	Paint Storage/ Base Hazardous Storage	Cold War	Ineligible	A-3	1958	Building associated with Bomarc Missile Program. Site functioned as a telemetry ground center. Building has been used as a storage facility.
8OK01432 /#8320	Drone Control Center/ Electronic Research Radar Facility	Cold War	Eligible	A-3	1957	Building is an electronic research radar facility constructed in support of the Bomarc Missile Program..
8OK01433 /#8351	Water Supply Building	Cold War	Ineligible	A-3	1957	Building was designed and has always been used as a water supply building. Building is part of the Bomarc Missile Program.
8OK01434 /#8352	Electric Power Plant	Cold War	Ineligible	A-3	1957	Building was constructed to provide power to Site A-3 radar systems. The site was used to support the Bomarc Missile Program.
8OK01435 /#8353	Microwave Station	Cold War	Ineligible	A-3	1956	Building is a high frequency microwave station in support of the Bomarc Missile Program. Building addition in 1958.

Table C-2. Historic Structures Recorded Within Project Area Cont'd

Site Number	Site Name	Period	NRHP Status	Test Area	Year Built	Comment
8OK01496 /#8354	Microwave Tower	Cold War	Ineligible	A-3	1970	Tower was built in support of the Bomarc Missile Program. The building is used in conjunction with 8353 for microwave support.
8OK01436 /#9200	Ferry Slip/ Cargo Pier	Cold War	Ineligible	A-10	1946	Used for the arrival of German made V-1 missiles. The structure was used in the JB-2 Program. The original ramp was replaced in 1958.
8OK01437 /#9201	Warehouse	Cold War	Demolished	A-10	1947	Building was erected in support of the JB2 program. It was used as a warehouse.
8OK01438 /#9203	Water Supply Building/ WRM Medical Storage	Cold War	Ineligible	A-10	1947	Building was erected for a water supply in support of the JB-2 Rocket Program.
8OK01439 /#9207	Microwave Relay Facility/ Air Communication and Relay Center	Cold War	Ineligible	A-10	1957	Building was erected in support of the B-17 Drone program. Building has served as a microwave relay station, global and air communications facility.
8OK01440 /#9208	Squadron Operations/ Research Equipment Storage	Cold War	Ineligible	A-10	1947	Building built for JB-2 Program. Building has served as a squadron operations facility and research equipment storage facility.
8OK01441 /#9210	Airman's Dining Hall/ Research Equipment Storage Facility	Cold War	Ineligible	A-10	1947	Building was originally the Airman's Mess Hall for the JB-2 project. Later used for research equipment storage and offices. In 1959 building was the primary office for DARPA Project 4771.
8OK01442 /#9211	Latrine/ Sanitary Latrine	Cold War	Ineligible	A-10	1947	Building was a men's latrine for the JB-2 Program. The building was later converted for men and women showers and latrine.
8OK01443 /#9212	Motor Repair Shop/ Base Engineering Maintenance Shop	Cold War	Ineligible	A-10	1947	Building was a small motor repair shop for the JB-2 Program. Building has since become a maintenance repair shop for base engineering.
8OK01444 /#9221	Fuel Metering Test Building/ Base Hazardous Storage Facility	Cold War	Ineligible	A-10	1947	Building was a fuel metering test facility for the JB-2 Program. Subsequently served as missile and fuel storage area. Now building stores base hazardous material.
8OK01445 /#9223	Missile Assembly Building/ Base Covered Storage Facility	Cold War	Ineligible	A-10	1947	Missile assembly facility for the JB-2 Program. Building is now used for base engineering storage facility.
8OK01446 /#9225	Motor Assembly Building/ Base Storage Facility	Cold War	Ineligible	A-10	1947	Motor assembly facility for the JB-2. Building is now a guided weapons assembly/ storage facility.
8OK01447 /#9228	Theodolite Camera Facility	Cold War	Ineligible	A-10	1957	Building houses a theodolite camera that is used as a sighting and measurement telescopic instrument. The camera gives horizontal and vertical angles for missile launches over the Eglin Gulf Test Range.

Table C-2. Historic Structures Recorded Within Project Area Cont'd

Site Number	Site Name	Period	NRHP Status	Test Area	Year Built	Comment
Building # 9240	Armament Research Test Facility	Cold War	Review	A-10	1947	Information unavailable.
8OK01448 /# 9260	Fuze Storage Facility	Cold War	Ineligible	A-11A	1946	Building was erected to store the Fuses for rockets launched at A-11.
8OK01449 /# 9261	Segregated Storage Magazine/ Munitions Storage Igloo	Cold War	Ineligible	A-11A	1947	The facility is a variation of the standard Army Igloo dated 1941-1945. The facility is used to store munitions.
Building # 9268	Missile/Space Research Eng.	Cold War	Review	A-11	1957	
Building # 9270	Missile/Space Research Eng.	Cold War	Review	A-11	1957	
Building # 9296	Water Supply Building	Cold War	Review	A-13	1957	
Building # 9297	Electronic Research Test Facility	Cold War	Review	A-13	1957	
Building # 11097	Helicopter Pad	Cold War	Eligible	A-15	1958	Building is eligible for sole nomination to the NRHP and is considered a contributing member to a possible district.
Building # 12503	Potable Water Supply	Cold War	Eligible	A-15	1960	Building is eligible for sole nomination to the NRHP and is considered a contributing member to a possible district.
Building # 12505	750 Gallon Steel Gas Tank	Cold War	Demolished	A-15	1961	Demolished by Eglin date undetermined.
Building # 12506	Armament Research Test Facility/ Protective Shelter	Cold War	Demolished	A-15	1962	Demolished by Eglin date undetermined.
Building # 12508	Utility Vault/ Cable Junction House	Cold War	Eligible	A-15	1958	Building is eligible for sole nomination to the NRHP and is considered a contributing member to a possible district.
Building # 12510	Armament Research Test Facility/ CFD Building	Cold War	Eligible	A-15	1960	Building is eligible for sole nomination to the NRHP and is considered a contributing member to a possible district.
Building # 12511	Water Storage Tank	Cold War	Eligible	A-15	1958	Building is eligible for sole nomination to the NRHP and is considered a contributing member to a possible district.
Building # 12512	Armament Research Test Facility/ Masonry Building	Cold War	Ineligible	A-15	1989	Building was not part of the BOMARC program. It was used in the SDI program.
Building # 12513	Supply Equipment Warehouse/ Airman's Dining Hall	Cold War	Demolished	A-15	1958	Demolished by Eglin 1989 or earlier.
Building # 12514	Missile Launch Control/ Interceptor Missile Squadron Operations	Cold War	Eligible	A-15	1959	Building is eligible for sole nomination to the NRHP and is considered a contributing member to a possible district.

Table C-2. Historic Structures Recorded Within Project Area Cont'd

Site Number	Site Name	Period	NRHP Status	Test Area	Year Built	Comment
Building # 12515	Fire Station	Cold War	Eligible	A-15	1958	Building is eligible for sole nomination to the NRHP and is considered a contributing member to a possible district.
Building # 12516	Water Supply Building/ Engineering Storage Facility	Cold War	Eligible	A-15	1958	Building is eligible for sole nomination to the NRHP and is considered a contributing member to a possible district.
Building # 12517	Armament Research Test Facility/ Masonry Building	Cold War	Ineligible	A-15	1989	Building was not part of the BOMARC program. It was used in the SDI program.
Building # 12518	Pump Station	Cold War	Demolished	A-15	1958	Demolished by Eglin 1984 or earlier
Building # 12519	Missile and Space Research and Testing Facility/ Temporary Office and Storage	Cold War	Eligible	A-15	1960	Building is eligible for sole nomination to the NRHP and is considered a contributing member to a possible district.
Building # 12520	Security and Identification Building	Cold War	Demolished	A-15	1958	Demolished by Eglin 1988 or 1989.
Building # 12521	Missile and Space Research and Testing Facility/ Assembly and Maintenance Shop	Cold War	Eligible	A-15	1960	Building is eligible for sole nomination to the NRHP and is considered a contributing member to a possible district.
Building # 12522	Missile and Space Research and Testing Facility/ General Purpose Building	Cold War	Eligible	A-15	1960	Building is eligible for sole nomination to the NRHP and is considered a contributing member to a possible district.
Building # 12523	Electrical Transformer Substation 3A	Cold War	Ineligible	A-15	1958	Area is fenced in. Only the concrete pad remains.
Building # 12524	Fuel Oil Storage Tank	Cold War	Demolished	A-15	1958	Demolished by Eglin 1984 or earlier.
Building # 12525	Liquid Fuel Unloading Pier	Cold War	Eligible	A-15	1958	Structure is eligible for nomination to the NRHP on its own merit and is considered a contributing member to a possible district.
Building # 12526	Base Hazardous Storage Facility/ Change House	Cold War	Ineligible	A-15	1958	Demolished by Eglin 1984 or earlier.
Building # 12527	Underground Troop Shelter	Cold War	Ineligible	A-15	1960	Structure is identified on real property records but cannot be located.
Building # 12528	Missile Launch Control/ Operations Center	Cold War	Eligible	A-15	1958	Building is eligible for sole nomination to the NRHP and is considered a contributing member to a possible district.
Building # 12530	Electric Power Station Building/ Heat and Power Building	Cold War	Demolished	A-15	1958	Demolished by Eglin in 1989 or later.

Table C-2. Historic Structures Recorded Within Project Area Cont'd

Site Number	Site Name	Period	NRHP Status	Test Area	Year Built	Comment
Building # 12531	Missile and Space Research and Testing Facility/ Air Force Office Building	Cold War	Demolished	A-15	1960	Building has been replaced by another building of similar design using the original foundation
Building # 12533	Troop Shelter	Cold War	Ineligible	A-15	1961	Building is ineligible for sole nomination to the NRHP and is considered a contributing member to a possible district.
Building # 12534	Air Conditioning Plant Building/ Refrigeration Building	Cold War	Ineligible	A-15	1958	Building is ineligible for sole nomination to the NRHP and is considered a contributing member to a possible district.
Building # 12535	Missile and Space Research and Testing Facility/ Protective Shelter	Cold War	Ineligible	A-15	1961	Structure is identified on real property records but cannot be located.
Building # 12576	Chemical Spill Pump Station	Cold War	Demolished	A-15	1958	
Building # 12540	Propellant Fuel Facility	Cold War	Eligible	A-15	1958	Demolished by Eglin 1984 or earlier. Remains of the structure extant.
Building # 12541	Fuel Spill Pit	Cold War	Demolished	A-15	1958	Demolished by Eglin 1984 or earlier.
Building # 12542	Foam and Pump House	Cold War	Demolished	A-15	1958	Demolished by Eglin 1984 or earlier.
Building # 12543	Acid Spill Pit	Cold War	Demolished	A-15	1958	Demolished by Eglin 1984 or earlier.
Building #12555	Acid Neutralizing and Spill Pits	Cold War	Demolished	A-15	1958	
Building # 12546	Propellant Acid Facility	Cold War	Demolished	A-15	1958	Demolished by Eglin 1984 or earlier.
Building # 12548	Electrical Transformer Substation	Cold War	Eligible	A-15	1959	Structure is eligible for nomination to the NRHP on its own merit and is considered a contributing member to a possible district.
Building # 12549	Research Equipment Storage Facility/ Sandia Building	Cold War	Eligible	A-15	1959	Building is eligible for sole nomination to the NRHP and is considered a contributing member to a possible district.
Building # 12550	Missile and Space Research and Testing Facility/ Bunker #8	Cold War	Duplicate	A-15	1959	Eligible under Criteria A, C, and G.
Building # 12550	Missile and Space Research and Testing Facility/ Bunker #8	Cold War	Eligible	A-15	1959	Building is eligible for sole nomination to the NRHP and is considered a contributing member to a possible district.
Building # 12551	Launch Area Support Building	Cold War	Eligible	A-15	1959	Building is eligible for sole nomination to the NRHP and is considered a contributing member to a possible district.
Building # 12552	Missile and Space Research and Testing Facility/ Cable Shelter	Cold War	Eligible	A-15	1959	Building is eligible for sole nomination to the NRHP and is considered a contributing member to a possible district.

Table C-2. Historic Structures Recorded Within Project Area Cont'd

Site Number	Site Name	Period	NRHP Status	Test Area	Year Built	Comment
Building #12555	Research Equipment Storage Facility	Cold War	Demolished	A-15	1968	
Building # 12554	Model IVB Shelter	Cold War	Demolished	A-15	1960	Demolished by Eglin 1989
Building # 12555	Electronic Research and Engineering Facility	Cold War	Ineligible	A-15	1968	Building is not part of the BOMARC program and therefore is not eligible.
Building # 12556	Model V Shelter	Cold War	Eligible	A-15	1960	Building is eligible for sole nomination to the NRHP and is considered a contributing member to a possible district.
Building # 12558	Model V Shelter	Cold War	Eligible	A-15	1960	Building is eligible for sole nomination to the NRHP and is considered a contributing member to a possible district.
Building # 12559	Protective Shelter	Cold War	Demolished	A-11	1962	Demolished by Eglin date undetermined.
Building # 12561	Antenna Tower and Support Structure	Cold War	Ineligible	A-15	1968	Tower was not part of the BOMARC program. It was used in the SDI program.
Building # 12564	Model III Shelter	Cold War	Demolished	A-15	1958	Demolished by Eglin 1989 through 1991.
Building # 12566	Model II Shelter	Cold War	Demolished	A-15	1958	Demolished by Eglin 1989 through 1991.
Building # 12568	Model II Shelter	Cold War	Demolished	A-15	1958	Demolished by Eglin 1989 through 1991.
Building # 12571	Model I Shelter	Cold War	Demolished	A-15	1958	Demolished by Eglin 1989 through 1991.
Building # 12572	Model I Shelter	Cold War	Demolished	A-15	1958	Demolished by Eglin 1989 through 1991. Remains of the structure remain
Building # 12573	Model I Shelter	Cold War	Demolished	A-15	1958	Demolished by Eglin 1989 through 1991.
Building # 12574	Model I Shelter	Cold War	Demolished	A-15	1958	Demolished by Eglin 1989 through 1991. Remains of the structure remain
Building # 12576	Industrial Waste Treatment and Disposal Facility/ Chemical Spill Station	Cold War	Eligible	A-15	1958	Building is eligible for sole nomination to the NRHP and is considered a contributing member to a possible district.
Building # 12577	Missile and Space Research and Testing Facility/ Paul Hardeman Building	Cold War	Eligible/ Demolished	A-15	1959	Building was eligible but demolished.
Building # 12580	Compressor Building	Cold War	Demolished	A-15	1958	Demolished by Eglin 1984 or earlier.
Building # 12582	Model IVB Shelter	Cold War	Demolished	A-15	1960	Demolished by Eglin 1989
Building # 12583	Model IVB Shelter	Cold War	Demolished	A-15	1960	Demolished by Eglin 1989
Building # 12584	Model IVB Shelter	Cold War	Demolished	A-15	1960	Demolished by Eglin 1989

Table C-2. Historic Structures Recorded Within Project Area Cont'd

Site Number	Site Name	Period	NRHP Status	Test Area	Year Built	Comment
Building # 12585	Model IVB Shelter	Cold War	Demolished	A-15	1960	Demolished by Eglin 1989
Building # 12586	Model IVB Shelter	Cold War	Demolished	A-15	1960	Demolished by Eglin 1989
Building # 12587	Model IVB Shelter	Cold War	Demolished	A-15	1960	Demolished by Eglin 1989
Building # 12588	Munitions Storage Igloo/ Warhead Storage	Cold War	Ineligible	A-15	1960	Building is ineligible for sole nomination to the NRHP and is considered a contributing member to a possible district.
Building # 12590	Emergency Power Plant	Cold War	Demolished	A-15	1962	Demolished by Eglin date undetermined.
8OK02252	Bunker	Cold War	Potential	A-4A	1955	The structure was possibly used for the storage of NIKE Missile warheads.

C.2 Marine Cultural Resources

Historical Perspective

As late as 1686, early Spanish explorers thought the coastline of the Gulf of Mexico was a continuous peninsula with a large flowing river behind it. As they continued to misjudge the natural boundaries of the Gulf, ships continued to blunder into reefs, shoals and bars. Navigational errors were abundant, leaving in their wake massive amounts of shipwrecks, some still undetected today. French explorers were able to map some of the coastline, particularly barrier islands along the northern coast of the Gulf. Spanish explorers made little effort to infiltrate and settle this area at that time; thus, La Salle and Iberville were able to establish trade routes avoiding some of the barrier islands and shoals. Eventually, the Spanish were able to establish some trade routes based upon the French cartographers knowledge (Garrison et al, 1989). However, since natural shoals and barriers change with winds, currents and sediment, problems arose when these went undetected, leading to the numerous shipwrecks that are now lying at the bottom of the Gulf.

Shipwrecks within Eglin boundaries, that lie further offshore than potential sand source areas, were often the result of natural causes such as severe weather. Determining spatial patterns for shipwrecks in the Gulf of Mexico has not been a very productive task. Furthermore, these patterns tend to vary due to wind strength, direction and current shears. It is clear, however, that most deep-water shipwrecks were due to hurricanes (Garrison et al., 1989). Literature indicates that less than two percent of pre-20th century ships and less than 10 percent of all ships reported lost in the Gulf between 1500 and 1945 have known locations (MMS, 1990). Ships have been lost since the period of Spanish exploration until the modern age of shipping and commerce.

Historic Shipwrecks

Spanish exploration and subsequent colonization began in 1508 and lasted for approximately two centuries, growing with a settlement and fort in Pensacola. During this time period, the Spanish

dominated maritime activities with galleons, frigates and various other light and heavy sailing craft. The French began to arrive shortly after, and their numbers increased until 1793. English and Spanish colonists displaced the French during the end of the eighteenth century (CEI, 1977). With the acquisition of Florida and Louisiana, the era of American commerce began and grew between 1830 and 1845 increasing ship traffic for the transport of cotton, lumber, and grain. Offshore in the vicinity of forts, there are numerous shipwrecks from the Civil War (1860-1865) that were used to guard harbor entrances and channels. Between the Civil War and the present, many ships that were used for such things as smuggling, defense, trade, and industry were lost in the Gulf (CEI, 1977; USAF, 1996). There are 271 known shipwrecks listed for the Panhandle region of Florida, beginning with the sinking of a fleet of Spanish ships in 1553 and ending with the sinking of a hopper barge in 1986. Due to the sensitive nature of shipwrecks, the locations of known wrecks will not be included in this document.

A study was performed by Coastal Environments, Inc. (1977) that mapped the locations of known shipwrecks. A literature search of both shipwrecks and reported ship losses was combined with factors that are known to affect ship loss (reefs, straits, approaches to seaports and storms). The results were used to determine areas that may have a high probability for shipwrecks. It is now known that shipwrecks tend to be clustered around navigational hazards and port entrances. Two-thirds of the wrecks were found within 1.5 kilometers of the coastline and 500 wrecks were found between 1.5 and 10 kilometers from the coastline of the northern Gulf (CEI., 1977). Texas A&M University performed a study for the MMS that identified approximately 3,500 potential shipwreck locations, thus expanding the database (Garrison et al., 1989). With the data generated from the studies, the MMS has identified high-probability zones for shipwrecks within the offshore area of Pensacola and Apalachicola-Cape San Blas (Garrison et al., 1989).

Eglin has documented the location of known shipwrecks within their over-water ranges (e.g., off the south coast of Cape San Blas). This information is currently located at the Federal Preservation Office for management. Presently, the Historic Preservation Plan for Eglin AFB does not have any information specific to the management of submerged resources.

During the 1960s the U.S. National Park Service (NPS) began to investigate shipwrecks and document their conditions and locations. Recently, the Submerged Cultural Resources Unit of the NPS began to survey the numerous wrecks in Dry Tortugas National Park. More than 200 known vessels can be found within the park. Florida has created a Management Plan for Submerged Cultural Resources, which provides submerged sites the same level of protection as terrestrial sites, guidance on the management of state owned submerged cultural resources, and a plan for managing state owned historic shipwrecks in accordance with the Abandoned Shipwreck Act.

Prehistoric Sites

Approximately 20,000 years ago, the Wisconsinan glaciation period was near it's maximum, resulting in large ice sheets that drew water from much of the world's oceans. Sea level reduction was so drastic that Florida's coastline extended more than 100m (meters) from where it

currently stands (Myers et. al, 1990). The maximum low sea level stand occurred about 16,000 BC (Coastal Environments, Inc., 1982), prior to mass deglaciation that resulted in sea level transgressions. This 18,000year old sea level marker is referred to as the Pleistocene shoreline. This is a relict beach or coastline that is currently depicted on the sea floor of the Gulf and is referred to as the 'prehistoric high probability zone'. Sea levels in the Southeastern United States began to stabilize about 5,000 B.C. as deglaciation began, allowing for permanent coastal habitation. Because of the gradual rise in sea level until that time period, submerged prehistoric sites may be present in the Gulf.

Just like present-day peoples, prehistoric peoples had a tendency to settle near water resources, utilizing them for food, travel and other resources. This would include the Gulf, as well as rivers that empty into the Gulf. Archaeological evidence does in fact, show that "the peopling of the New World," could have begun as early as 13,000 years ago (calibrated radiocarbon date) (Fagan, 1999). At this time period, sea level was still - 60m mean sea level (MSL) below its modern stand (Stright, 1990). Thus, evidence does argue for Native American settlements for this time period. Unfortunately, this evidence lends itself to depict that, in all probability, the oldest sites lie on the Gulf's floor.

Criteria used to determine the potential for submerged prehistoric sites revolve around two main factors: the presence of submerged geologic formations that would have a high probability of associated prehistoric sites (such as relict shorelines or remnant, incised rivers and streams) and the known natural occurrences that would preserve a site, such as sedimentation and tidal movement. Geologic features in the Gulf of Mexico such as karst topography, relict barrier islands with back barrier bays and lagoons, and coastal dune lakes can also be used as indicators of human habitation areas, thus having a higher than average probability of containing prehistoric sites. Sites that may exist in a high-probability zone such as this may include Paleo-Indian, Archaic, and Early Gulf Formational periods (USAF, 1996).

Preservation Factors

The potential for preservation of prehistoric sites and shipwrecks must be considered an important possibility when researching the effects of offshore activities that impact sediments. Sediments and preservation potential have been found to have a great deal of bearing upon prehistoric sites and shipwrecks (Garrison, et al, 1989). The varying types of sands, silts and clays have a direct bearing on preservation. For example, unconsolidated marine sands have a low preservation potential. Sandy/silty areas are deemed low to moderate and silts, alone, are considered to have a moderate preservation potential. Silty/clay areas are moderate to high, where as clay has the highest potential for preservation (Garrison, et al, 1989). The current area of impact would be considered low to moderate in preservation potential.

In addition to the above, preservation of shipwreck materials in the marine environment depends upon a variety of other factors, as well. These include: the interaction of shipwreck material with the type of sediment, sediment depth, depositional energy, water depth, water temperature, water column chemistry and biological activity (Garrison, et al, 1989). Preservation of organic matter, such as wood, usually occurs at a higher rate in cold water than in warmer waters. This theory, however, is not entirely correct, as proven in the case of the RMS Titanic. Biological activity,

such as worm borers, depleted most of the ship's wood. In addition to the lack of preservation of wood, iron depletion has also occurred by marine organisms that proliferate at depths that previously were unexpected (Garrison, et al, 1989).

One of the most important factors for site preservation is rapid burial. Whether a site is of a prehistoric nature or a shipwreck, rapid inundation is key for it to serve in tact. Either continual, high energy wave action or sedimentation can and does lead to site destruction. The continual battering cannot be sustained without the loss of the site just as a hurricane would, with continual high winds, leave destruction in its path. Smooth, rapid burial either by sea level transgression or sedimentation is a necessary ingredient for a site of any kind to have a chance of survival.

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APPENDIX D

SUPPORTING INFORMATION FOR BIOLOGICAL RESOURCES

SUPPORTING INFORMATION FOR BIOLOGICAL RESOURCES

Supporting Information for Sensitive Species

Sea Turtles

Of the five species of marine turtles found in the Gulf of Mexico, two species are known to nest regularly on Santa Rosa Island (SRI) beaches. These species are the Atlantic green turtle and the Atlantic loggerhead turtle. However, the majority of nests on SRI are from loggerhead sea turtles. In June 2000, leatherback nesting activity was documented for the first time in Okaloosa County, on Eglin's portion of SRI (Miller, 2001). The U.S. Fish and Wildlife Service (USFWS) oversees the sea turtle protection and conservation of habitat on land, while the National Marine Fisheries Service (NMFS) oversees its protection in marine waters. Most sea turtles nest on beaches in northwest Florida from mid-May through the end of August.

Beach Densities

Eglin conducts monitoring surveys seven days a week from 15 May to 31 October. Turtle crawls are identified as either a true nesting crawl or false crawl (no nesting activity associated with the crawl). The sea turtle nests are marked with stakes and surrounded with surveyor flagging tape. Nests are then monitored throughout the entire incubation period for potential storm damage, hatching activity, and predation. Nests are only relocated if threatened by erosion, inundation, or predation.

For mapping purposes, beachfront at SRI was divided into 0.5-mile survey zones, and nesting data were recorded according to the zone in which they occur. In Chapter 3, Figure 3-6 shows these zones and also provides a color-coded indication of nesting intensity for each zone by species. The pink color below each nesting zone indicates the total number of loggerhead nests, the green color indicates the total number of green turtle nests, and the blue color indicates the total number of leatherback sea turtle nests. This color-coded map feature was created to provide an overall picture of relative nesting intensity across the Island. These averages were calculated over 17 years for the Atlantic loggerhead and over 9 years for Atlantic green turtles due to the fact that between 1989 and 2002 green turtles were known to nest only every other year on SRI. However, in 2003 there were four green sea turtle nests, in 2004 there were none, and in 2005 there were seven, possibly indicating a new trend.

Due to the seasonality of sea turtle nesting and hatching behavior, the effects of each proposed activity must be analyzed according to the time period during which it takes place. To simplify the analysis of impact to Eglin's nesting population, the sea turtle reproduction cycle can be divided into four time periods. During the first time period, only nesting occurs within the activity area. During the second time period, hatchlings emerge from previously laid nests while adult sea turtles continue to come ashore to lay new nests. During the third time period, adults have ceased to come ashore for nesting while hatchlings continue emerging from existing nests. During the fourth time period, neither nesting nor hatching behavior is expected to occur in the

activity area. Because nesting and hatching activity usually occurs under the cover of darkness, nighttime operations are more likely to impact reproduction.

An analysis of emergence data for SRI revealed that out of 186 loggerhead nests with known incubation lengths, 151 (or 81 percent) hatched after 60 to 80 days of incubation. The shortest recorded incubation length for a loggerhead nest is 53 days and the longest is 88 days. Out of 57 green turtle nests, 43 (or 75 percent) hatched after 60 to 80 days of incubation. The shortest recorded incubation length for a green turtle nest is 51 days and the longest is 82 days. The two recorded incubation lengths for leatherback nests were 85 and 94 days (USAF, 2003). Overall, the earliest recorded sea turtle nest at Eglin SRI was recorded on 12 May and the latest nest was recorded on 22 August. The overall average incubation length for all species was 67 days. Based on this information, four time periods were calculated for each species. The earliest and latest possible dates for all species were selected to produce the combined species time periods (Table D-1).

Table D-1. Sea Turtle Nesting and Hatching Periods by Species

Species	Nesting Only	Nesting and Hatching	Hatching Only	Off-Season
Caretta caretta	5/23 – 7/14	7/15 – 8/22	8/23 – 11/19	11/20 – 5/22
Chelonia mydas	5/20 – 7/9	7/10 – 8/22	8/23 – 11/12	11/13 – 5/19
Dermochelys coriacea	5/12 – 6/19	N/A	8/5 – 9/21	9/22 – 5/11
Combined Species	**5/12 – 7/9**	**7/10 – 8/22**	**8/23 – 11/19**	**11/20 – 5/11**

Based on the data presented in Table D-1, activities taking place on SRI between 20 November and 11 May effectively have a 0 percent probability of impacting sea turtle nesting and hatching activities. However, the USFWS and Eglin have agreed to use 1 May through 31 October as Eglin's official sea turtle season because very few hatching events actually occur in November. All references in this document to sea turtle season refer to this period (1 May through 31 October). In certain cases, it will be more appropriate to divide the sea turtle season into separate periods, one for nesting and one for hatching. Sea turtle nesting season for Eglin will be considered 1 May through 31 August and sea turtle hatching season will be 1 July through 31 October. The combined sea turtle nesting and hatching seasons, or sea turtle season, will run from 1 May through 31 October.

If the Proposed Action occurs within the sea turtle nesting and/or hatching time periods, in order to better quantify possible impacts, it is necessary to determine how nesting and hatching activity is distributed throughout these time periods. Figure D-1 shows the average number of nests that have occurred on Eglin SRI by month. Again, the total number of green turtle nests was averaged over 9 years, while that for loggerheads and leatherbacks was averaged over 17 years. This information indicates that the peak nesting period for loggerhead sea turtles occurs in June, earlier than the peak green turtle nesting period, which occurs in July.

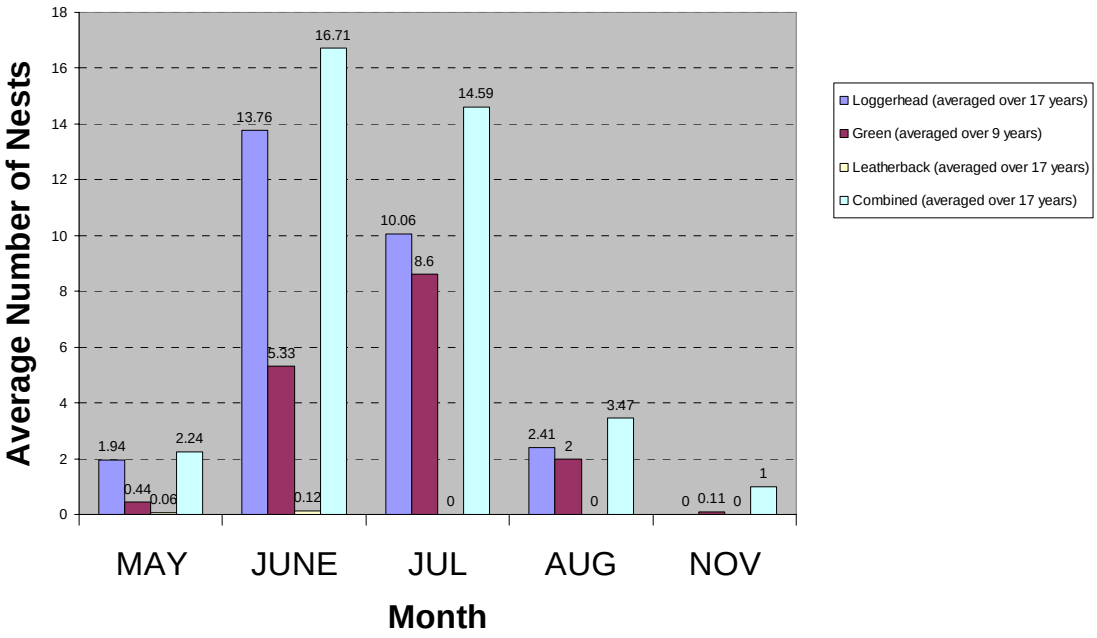

Figure D-1. Eglin AFB SRI Average Sea Turtle Nest Occurrences by Month (1989-2005)

The peak nesting season can be estimated using the information in Figure D-1. The information displayed in the figure indicates that loggerhead nesting peaks in June. Dividing the average number of nests occurring in June by 30 days yields a peak nesting emergence rate of 0.459 nests per night. By the same method, during a green turtle nesting year, the peak nesting rate is calculated to be 0.277 nests per night (number of green turtle nests in July, divided by 31 days). To determine the peak nesting rate within a 0.5-mile section of beachfront, the peak nesting emergence rate for each species is divided by the number of 0.5-mile segments comprising Eglin AFB sea turtle nesting beach (i.e., 34). Therefore, the peak rate of loggerhead turtle nesting emergences is 0.014 nests per night per 0.5 mile, and the peak rate of green turtle nesting emergences is 0.008 nests per night per 0.5 mile. Because only three leatherback nests have been documented on Eglin AFB SRI over a 17-year period, the leatherback nesting emergence rate is effectively nil.

Because historical hatchling emergence data for Eglin AFB SRI are incomplete, an expected average emergence by month was calculated for each species based on the available emergence data. For example, hatchling emergence dates have been recorded for 195 of 363 total loggerhead nests. Of the 195 recorded hatching dates, only four (2.05 percent) occurred in July. If this percentage is applied to the total number of loggerhead nests recorded, 7.45 loggerhead nests would be expected to have hatched in July over the 17-year data collection period, yielding an average of 0.43 loggerhead hatchings annually during the month of July. Once again, the total for green sea turtles was averaged over 9 years and, the combined average is over 17 years. Table D-2 summarizes this information and also provides an estimated number of hatching events expected in each given month. Emergence dates are not available for a randomly selected sample of nests for each species, and therefore these averages may be slightly skewed. However, because emergence dates were available for 257 out of the 477 total nests (54 percent), the

calculated averages for the number of nests hatching per month should suffice for purposes of this analysis (Table D-2).

Table D-2. Eglin AFB SRI Calculated Average Sea Turtle Hatching Occurrences by Month

		Loggerhead	Green	Leatherback	Combined
	Total Nests	363	111	3	477
	No. Nests with recorded hatching dates	195	60	2	257
July	Calculated Average	0.43	0.37	0.00	0.66
August	Calculated Average	10.95	3.49	0.00	12.77
September	Calculated Average	7.77	5.76	0.18	11.03
October	Calculated Average	1.86	1.85	0.00	2.84
November	Calculated Average	0.22	0.00	0.00	0.22

Atlantic Loggerhead Sea Turtle

The loggerhead turtle (*Caretta caretta*), federally and state listed as threatened, gained its status on 28 July 28 1978. Loggerhead nests in Florida account for 90 percent of all loggerhead nests in the United States. From March through June, adult loggerheads congregate in the nearshore and offshore waters of the Gulf of Mexico to mate. Their nesting sites are on the numerous barrier islands and beaches between the Florida Keys and the northern Gulf of Mexico. Nesting females approach SRI in the spring and summer to dig their nests between the high tide mark and the dune line and sometimes between dunes. These turtles are the most commonly seen sea turtles in the southeastern United States and may be found near underwater structures and reefs (USAF, 2005).

Genetic research (mtDNA) has identified five loggerhead nesting subpopulations in the western North Atlantic: (1) the Northern Subpopulation occurring from North Carolina south to around Cape Canaveral, Florida (about 29o N.); (2) South Florida Subpopulation occurring from about 29o N. on Florida's east coast to Sarasota on Florida's west coast; (3) Dry Tortugas, Florida, Subpopulation; (4) Northwest Florida Subpopulation occurring at Eglin AFB and the beaches near Panama City; and (5) Yucatán Subpopulation occurring on the eastern Yucatán Peninsula, Mexico (Bowen et al., 1993; Encalada et al., 1998). These data indicate that gene flow between these four regions is very low. If nesting females are extirpated from one of these regions, regional dispersal would not be sufficient to replenish the depleted nesting subpopulation.

Atlantic Green Sea Turtle

The green sea turtle (*Chelonia mydas*) was listed as federally threatened on July 28, 1978, in all its eastern range of North America, except in Florida where it is listed as endangered. The state also lists it as endangered. In the United States, it nests on southern Florida beaches with a few exceptions in the northern Gulf of Mexico and North Carolina. The officially recognized nesting and hatching season for the green sea turtle extends from 1 May through 31 October in Florida’s panhandle. Nesting in the panhandle, however, has been consistently documented as an every other year event since 1990, with incubation periods ranging from 60 to 90 days. Eglin AFB SRI property supports the highest number of green sea turtle nests in northwest Florida.

Leatherback Sea Turtle

The leatherback sea turtle (*Dermochelys coriacea*) was originally listed as federally endangered on 2 June 1970, and is considered a state endangered species also. This species commonly nests along the shorelines of the Atlantic, Pacific, and Indian Oceans. Only infrequent nesting activity has been documented for the leatherback in northwest Florida (LeBuff, 1976; FWC FMRI, unpublished data; Longieliere et al., 1997). The officially recognized nesting and hatching season for the leatherback extends from 1 March through 30 September, with nest incubation ranging from 60 to 75 days (FWC FMRI unpublished data; Longieliere et al., 1997; FWC FMRI, 1998). Until the spring of 2000, the only confirmed leatherback nestings in northwest Florida were in Franklin and Gulf counties. In May and June 2000, leatherback nesting activity was documented for the first time in Okaloosa County on Eglin's portion of SRI (Miller, 2001).

Gulf Sturgeon

The USFWS and the National Oceanic and Atmospheric Administration (NOAA) Fisheries designated the Gulf sturgeon (*Acipenser oxyrinchus desotoi*) as threatened under the Endangered Species Act (ESA); listing became official on 30 September 1991. The state of Florida also considers the sturgeon a species of special concern.

The Gulf sturgeon is a large, cylindrical fish with an extended snout, vertical mouth, and chin barbells. The skin is scaleless and imbedded with five rows of bony plates or scutes. Adults range from 1.2 to 2.4 meters in length, with adult females generally larger than males. The Gulf sturgeon occurs predominately in the northeastern Gulf of Mexico, inhabiting offshore areas and inland bays during the winter months and moving into freshwater rivers during the spring to spawn (USFWS and GSMFC, 1995). Migration into freshwater generally occurs from March to May, while migration into saltwater occurs from October through November. Spawning takes place during April through June in fresh water. Within the region of influence (ROI), sturgeons occur in the Yellow River in the spring and summer, and in Choctawhatchee Bay, Santa Rosa Sound, and the Gulf of Mexico in the winter.

Gulf sturgeons are bottom feeders. Juvenile and young-of-the-year feed in freshwater, taking invertebrates and detritus (USFWS and GSMFC, 1995). Adult fish probably feed exclusively in marine (Gulf) and estuarine environments, eating primarily invertebrates including amphipods, lancelets, insect larvae, mollusks, polychaetes, gastropods, shrimp, isopods, brachiopods, and crustaceans. Little is known about the offshore distance the Gulf sturgeon travels. They are typically considered to occur within one mile of shore. Thus, the extent of Gulf sturgeon critical habitat in the Gulf is one mile offshore. The biggest threats to Gulf sturgeon populations are from shrimp trawls, dams, oil exploration activities, and waste disposal (Wooley and Crateau, 1985; MMS, 1990; Paruka, 1996).

Bottlenose Dolphin

The bottlenose dolphin (*Tursiops truncatus*), perhaps the most commonly known marine mammal, lives in waters throughout the world. They are distributed in a variety of habitats in tropical and temperate latitudes (Wells and Scott, 2002). Additionally, bottlenose dolphins live in waters

ranging from 50 to 90°C (Celsius). This species is probably the most adaptable marine mammal. Two forms have been identified, the coastal bottlenose dolphin and the offshore bottlenose dolphin. The former is found in bays, estuaries, sounds, and coastal waters of the Atlantic and Gulf of Mexico, while the latter can be found in deeper, pelagic habitats. Some populations of bottlenose dolphins stay in one area for their entire lives while others migrate to many different areas. Bottlenose dolphins have gray bodies with a lighter, sometimes white, belly. They range in size from 2 to almost 4 meters (m), dependent on geographical location. Females sexually mature between 5 and 13, while males mature between 9 and 14. Calves, 84-100 centimeters long, are born every 3 to 6 years. The coastal dolphin in the Atlantic and Gulf of Mexico is generally smaller than the offshore form. Davis et al. (2000) state that the annual abundance estimate is 5,618 individuals for the Gulf of Mexico.

The average herd or group size of Atlantic bottlenose dolphins in shelf and slope waters was approximately 4 and 10 individuals per herd as determined by GulfCet II surveys of eastern Gulf waters (Davis et al., 2000). Migratory patterns from inshore to offshore are likely associated with the movements of their prey rather than a preference for a particular habitat characteristic (such as surface water temperature) (Ridgway, 1972; Irving, 1973;). The coastal form eats bottom-dwelling fish and invertebrates, while the pelagic form consumes mesopelagic fish and squid. Sharks are their natural predators, and some dolphins have been found with stingray spines in and markings on their bodies.

Bottlenose dolphins have a repertoire of vocalizations including clicks, whistles, echolocation clicks, and pulses. One particular vocalization, the signature whistle, distinguishes each individual of the population from one another. Bottlenose dolphins face a variety of pressures ranging from habitat degradation and vessel traffic to pollutant introductions and fisheries interactions.

Atlantic Spotted Dolphin

Although the Atlantic spotted dolphin (*Stenella frontalis*) can be found in nearshore waters, little information has been obtained on the species. This dolphin is found only in the tropical and warm temperate waters of the Atlantic Ocean and Gulf of Mexico (Perrin, 2002). Atlantic spotted dolphins live in continental slope waters; however, they only occasionally come close to shore to pursue prey.

The adults of this species may be heavily spotted. The extent to which animals are spotted varies, sometimes geographically. For instance some Atlantic spotted dolphins in the Gulf have no spots, while species from coastal regions of the Atlantic may appear entirely white because of the numerous spots on their bodies. Females mature at 8 to 15 years and may continue to nurse calves at 5 years. Groups generally consist of no more than 50 individuals, but groups up to 100 animals have been recorded.

It is estimated that 3,213 Atlantic spotted dolphins may be found in Gulf waters (Davis et al. 2000). These dolphins are found in the Gulf over the shelf, and only bottlenose dolphins are sighted more often here than this species (Jefferson and Schiro, 1997). The preferred depth of the spotted dolphin is believed to be associated with food availability and water temperature. Their diet consists of small to large fish, cephalopods (squids), and invertebrates living in or on

the ocean floor. Little data on abundance and mortality exists and documentation shows small numbers of animals taken in fisheries. Table D-3 shows species densities for dolphins likely to occur within the project area.

Table D-3. Cetacean Statistics from Navy Technical Reports for the Eastern Gulf of Mexico

Species	Density Estimate (D)
Continental Shelf of the Eastern Planning Area	
Bottlenose dolphin	125.6
Atlantic spotted dolphin	124.9

Source: DoN, 2003
D = animals/1000 square kilometers (km^2)

The NMFS and USFWS administered MMPA protects all cetaceans (16 U.S.C. 1361 et seq., 1997 as amended). Offshore species are under the jurisdiction of the NMFS agency and the USFWS monitors coastal species.

Piping Plover

The piping plover (*Charadrius melodus*) is state and federally listed as endangered. Piping plovers are found in winter foraging habitats as early as mid-July and leave by mid-May (Federal Register, 2001). This birds' primary winter range is along the Atlantic and Gulf coasts from North Carolina to Mexico and into the Bahamas and West Indies (USFWS, 1996). Piping plovers are commonly documented during winter in the Florida panhandle with highest numbers of birds occurring in Franklin, Gulf, and Bay counties. Even though Florida has not been considered a primary wintering area for piping plover, diminishing habitat along other Gulf coast areas may be affording the piping plover new wintering grounds in Florida. These winter foraging grounds are still considered less suitable, thus forcing the piping plover to utilize isolated patches. As a result, critical habitat has been designated for piping plovers along the Gulf coast of Florida.

Winter foraging critical habitat for the piping plover was designated on 10 July 2001 (66 *Federal Register* 36038). *Critical habitat* is a term that refers to specific geographic areas that contain the essential habitat features necessary for the conservation of threatened and/or endangered species. Although only a small section of SRI has been designated as critical habitat (Figure 3-6), piping plovers may be found anywhere that affords proper foraging and sheltering resources. Piping plovers are known to forage in exposed wet sand areas such as wash zones, intertidal ocean beachfronts, wrack lines, washover passes, mud and sand flats, ephemeral ponds, and salt marshes. They are also known to use adjacent areas for sheltering in dunes, debris, and sparse vegetation. All of these habitat types can be found on Eglin's portion of SRI. Although it is possible that piping plovers could use any one of these habitat types at any time during the winter foraging period, studies have shown that wintering plovers spend 76 percent of their time foraging for invertebrates found just below the surface of wet sand (Johnson and Baldassarre, 1988).

Eglin's Natural Resources Section (96 CEG/CEVSN) and volunteer personnel have periodically conducted shorebird surveys on SRI during the winter foraging period. These surveys included

participation in the International Piping Plover Census in January of 1991, 1996, and 2001. Piping plovers were not sighted on Eglin's property during any of these official surveys. During the 2001 survey, the closest sighting occurred at Navarre Beach State Park and Big Sabine Point (Ferland and Haig, 2002). Volunteers from the Choctawhatchee Audubon Society have conducted periodic shorebird surveys on SRI during which six piping plovers were documented foraging within the designated critical habitat. Two shorebird surveys were conducted on SRI during January and February of 2003, during which no piping plovers were sighted (Fenimore, 2003).

Santa Rosa Beach Mouse

The Santa Rosa beach mouse (*Peromyscus polionotus leucocephalus*) is one of five beach mouse subspecies and is the only subspecies not currently listed by either the state or the federal government. Santa Rosa beach mice are mostly nocturnal and burrow nest in dunes. They prefer sand-covered dune slopes with patches of grasses and herbs, and their diet consists of various plant seeds and insects. This population, which occurs only on SRI, was decimated after storm surge from Hurricane Opal in 1995 destroyed dune habitat. NRS personnel conducted monthly track count surveys indicate an increase in population since 1995. Hurricane Ivan in 2004 also decimated a large percentage of dune habitats. Preliminary results indicated that beach mice are still present; however, it is too early to determine the severity of impacts to the populations. Prior to hurricane Ivan, the NRS conducted quarterly track count surveys, since the hurricane the NRS has increased their surveys to monthly. The monthly surveys will continue for the next several months in order to gain a better understanding of impacts to the population. Current threats to this population include feral cat predation and loss of dune habitat from recreational foot traffic and storms.

Perforated Lichen

The Florida perforate reindeer lichen (*Cladonia perforata*) is state and federally listed as endangered. Extensive searches have shown this species to be extremely rare (only 12 documented sites). Three of the known populations occur on Eglin AFB Santa Rosa Island (SRI) property (Figure 3-6). *C. perforata* is mainly found in white sand scrub habitat in Florida, dominated by sand pine rosemary and other scrub oaks such as sand live oak and myrtle oak. *C. perforata* usually occurs in open areas between patches of scrub vegetation. In addition to habitat loss, *C. perforata* is also threatened by trampling, storm surges, and is susceptible to fires.

In 1995, Hurricane Opal destroyed two of these populations and reduced the remaining by more than 70 percent (Yahr, 2001). This reduced population persists just east of the Destin pass. In June 2000, two reintroduction populations were established in the area of the lost populations, near Test Site (TS) A-10 on the north side of SRI. The NRS has installed fencing around the perimeter of suitable habitat. Recently collected monitoring data indicate that the populations are stable with minimal dispersal.

Shorebirds and Wading Birds

Typical shorebirds and wading birds found on SRI include the snowy plover (*Charadruis alexandrinus*), state listed as threatened; little blue heron (*Egretta caerulea*), a state species of special concern; snowy egret (*Egretta thula*), a state species of special concern; black skimmer (*Rhynchops niger*), a state species of special concern; the least tern (*Sterna antillarum*), state listed as threatened; the tricolor heron (*Egretta tricolor*), a state species of special concern; and the white ibis (*Eudocimus albus*), a state species of special concern. Shorebird nesting season at SRI runs from 1 April through 31 August. Prior to Hurricane Ivan, in an effort to protect nesting shorebirds, the area between the Beach Club and the Destin Pass jetties on SRI was closed to the public. However, impacts from Ivan dramatically reduced the large shorebird nesting habitat in this area and topographically created a direct pathway from the public access points to the Gulf of Mexico shoreline. There is a large historical shorebird nesting area near the location of the beach club prior to Hurricane Ivan. This area was greatly changed during the storm but the Air Force does not anticipate any negative impacts to nesting success.

INVASIVE NON-NATIVE SPECIES

Chinese Tallow

Eglin first identified Chinese tallow colonization on SRI in 1996 during the assessment of impacts from Hurricane Opal. Chinese tallow (*Sapium sebiferum*) is a small to medium sized tree that can take over large areas of natural habitat by forming thick dense stands and out-competing native vegetation. Chinese tallow spreads rapidly and dense stands can become established across open areas. Seeds are transported by birds or water, which makes their dispersal very difficult to control. Control efforts by hand removal (pulling seedlings) began in 1997/1998, and it soon was apparent that herbicide treatments would be required.

Cogon Grass

On SRI, cogon grass has been documented at multiple locations with most occurrences linked to test sites or road maintenance activities. Cogon grass (*Imperata cylindrica*) is an upland weed, but it also occurs in places that become briefly flooded. Because of its extreme invasiveness and its ability to rapidly cover large areas, it is considered one of the world's 10 worst weeds. Cogon grass has a fibrous root system composed of underground stems (rhizomes) that form dense mats that exclude most other vegetation. Cogon grass spreads by seeds, vegetative reproduction of rhizomes, and the movement of seeds/rhizomes by road maintenance/construction vehicles and activities. Control operations on SRI have been conducted since 1995 and continue as required.

Torpedo Grass

Torpedo grass has been found on SRI. Torpedo grass (*Panicum repens*) is a perennial grass that frequently forms dense colonies and has long, creeping underground rhizomes. It thrives in moist, often sandy soil along beaches and dunes, margins of lagoons, marshy shorelines of lakes and ponds, drainage ditches and canals. However, it also does well in heavier upland soils. Its rhizomes or runners often extend several feet out into the water, and the plant frequently forms

dense floating mats. Where torpedo grass forms dense stands, it rapidly out-competes surrounding native vegetation. To date, herbicide treatments have not been conducted on this species.

Other Plant Species

There are additional invasive non-native plant species that have been found on SRI, but are not yet considered to be major problem species. Among those species are: lantana (*Lantana camara*), mimosa (*Albizia julibrissin*), purple sesban (*Sesbania punicea*), silverthorn (*Elaeagnus pungens*), natal grass (*Rhynchelytrum repens*), Chinese wisteria (*Wisteria sinensis*), asparagus fern (*Asparagus densiflorus*), and alligator weed (*Alternanthera philoxeroides*). The NRS will be closely watching these species to ensure they do not spread, and treating them where necessary.

Feral Cats

Feral cats are a major predator on native wildlife species. Over time, and with the assistance of humans, feral cats have become established on SRI. Feral cats hunt nesting shorebirds (least tern, black skimmer, snowy plover), Santa Rosa beach mice, and other birds and wildlife. Feral cats have also been documented to prey on sea turtle nestlings at other locations. Due to recent feral cat control efforts, feral cat numbers appear to be stable on SRI, but will require continued control efforts to maintain or lower the current population.

Coyote

The coyote has expanded its range into the southeastern United States and the USFWS and the Florida Fish and Wildlife Conservation Commission (FWC) considered it non-native to Northwest Florida coastal areas. It competes with the native gray fox and the introduced red fox, and hybridizes with the red wolf now extirpated from Florida. The coyote's presence precludes future reintroduction of the endangered red wolf in these areas (FNAI, 1994). Coyotes are especially problematic on the barrier island, where they prey on sea turtle nests and other sensitive species.

Red Fox

The red fox is an introduced species and the USFWS and FWC consider it to be non-native to the coastal areas of Northwest Florida. It competes with the native grey fox and other native species. As with the coyote, the red fox has been problematic on the barrier island where it preys on sea turtle nests and other sensitive species.

Fire Ants

Fire ants are found in open, disturbed areas, especially those that are wet. They are a threat to native wildlife populations, especially arthropods and reptiles, including their eggs. For instance, fire ants can infest sea turtle nests and significantly reduce future sea turtle populations. Fire ant predation of sea turtle nests on Eglin AFB barrier island property has not been documented. However, in previous years, Cape San Blas has experienced problems with fire ant depredation

to sea turtle nests. There is no documentation on the impacts fire ants have had on other sensitive species on Eglin property.

Cactus Moth

A relatively new invasive species in the Florida panhandle, the cactus moth (*Cactoblastis cactorum*), has been found at the Guard Gate on SRI and is of concern because it predates on native cacti. The late instar caterpillars eat any prickly pear cactus with flat pads.

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APPENDIX E

ENVIRONMENTAL RESTORATION PROGRAM SITES

Table E-1. Environmental Restoration Program Sites at Santa Rosa Island

Site Designation	Site Name	Site Location	Site Description	Site Status
ERP LF-22	A-11A Disposal Site	South of Hurlburt Field on SRI, approximately 6.9 miles west of the base gate	Landfill operations took place during the 1960s and 1970s and consisted of hardfill, metal spools, waste oil, and empty solvent drums. Site closure consisted of covering the wastes with several feet of local sandy soil. No chemicals of potential concern have been identified at the site. Beryllium and mercury were present in sediment samples at levels slightly above naturally occurring background levels.	Currently, no action is taking place at site. NFA is planned for the site.
ERP RW-42	Low-Level Radioactive Waste Site/Drum Burial	Western side of the A-15 compound	The site was used for the disposal of missile fragments, other metallic wastes, 55-gallon drums, and batteries. Additional soils have been removed and a third set of confirmatory samples was completed. Results indicate the petroleum contaminants on site are below regulatory limits for residential land use.	NFA
ERP SS-74	Officers' Beach Club	Site A-3 approximately 100 meters northeast of the former Officers' Beach Club	Fuel piping was sheared from two ASTs that led to the release of approximately 750 gallons of diesel fuel when Hurricane Opal passed over the site on 4 October 1995. Analyses indicated that no contamination of groundwater was present.	NFA
ERP SS-76	Radar Surveillance Site	Site A-17 approximately 2 miles east of Navarre Bridge on Eglin Road 242	Hurricane Opal caused a fuel pipeline to shear and moved an AST approximately 150 meters from its original location. Approximately 2,500 gallons of diesel fuel were released. Analyses returned all indicate that no contamination is present in groundwater monitoring wells.	NFA
ERP ST-259	Eglin Water Tower No. 12511	On SRI north of Range Road 242 and across the road from Building No. 12510.	Soil samples indicated concentrations of lead and arsenic above their respective Tier I and Tier II screening levels. Research proved that the paint used on these water towers is lead-based. Response actions include stripping lead-based paint off the tower, removing contaminated soil and replacing with clean soil.	Response actions scheduled for completion in 2006.
AOC-2	A-15 Former Power Plant Facility	Near northwest corner of A-15 Compound on SRI	Site identified as a potential source of environmental contamination resulting from past power generation activities. No soil or groundwater impacts were identified. The building was razed and the concrete sumps were cleaned out, with material disposed of properly.	File Closed

Table E-1. Environmental Restoration Program Sites at Santa Rosa Island Cont'd

Site Designation	Site Name	Site Location	Site Description	Site Status
AOC-42	VORTAC Generator Spill Site	Eastern end of SRI	This site is the location of an uncontrolled release of an unknown amount of fuel, likely associated with an UST and emergency generator located on site. Tanks were removed in 1994.	File Closed
AOC-43	BOMARC Launch Facility	A-15	Two hydraulic fluid reservoirs and associated pipe work and historic hydrazine and nitric acid spills are reportedly at this site. Appropriate removal actions and tank closure have been accomplished. Tanks were filled in place. No contamination is present.	File Closed
AOC-82	A-15 Compound Disposal Area	Near southwest corner of A-15 Compound on SRI	The site reportedly received only hardfill materials and construction debris. Geophysics results identified anomalies interpreted to represent subsurface materials. The site was closed with a soil cover. SI analytical results indicated no groundwater impacts.	File Closed
AOC-85	A-15 Compound Fire Training Area	Near northwest corner of A-15 Compound on SRI	This site consists of two independent structures used for fire training exercises. Fires at both locations were the result of a small quantity of liquid fuel and straw. Results indicated no groundwater or soil impacts. The sump material was removed in August 1997.	File Closed
AOC-94	A-11 Storage Bunkers	A-11 Compound on SRI	The site consists of two storage bunkers, identified as potential storage facilities for napalm and its constituents. Rocket engines and solid propellants were stored in the bunkers between test missions. It was later found that napalm was not stored here. No groundwater impacts were identified.	File Closed
AOC-95	Abandoned Radar Site Pipeline	Between a pier protruding in the Santa Rosa Sound and A-15	The 1,000-foot-long pipeline was identified as a potential source of environmental contamination as a result of diesel fuel handling. The pipeline was removed in 1990 and fuel recovery from the pipeline was necessary. All analysis results were below detection limits.	File Closed
AOC-111	A-15 Compound Neutralization Site	Near northwest corner of A-15 Compound on SRI	The site consists of the former neutralization pit, a 13-foot by 23-foot sump that was approximately 25 feet deep, used to neutralize acids. No soil impacts or groundwater impacts were identified.	File Closed
POI-322	Site A-15 PCB Cleanup	Eglin A-15 Compound, SRI	The PCB cleanup site is located at an abandoned electric substation. In 1983, PCB-impacted soil and transformer oil were removed from the site. Excavation and off-site disposal of the localized PCB-impacted soil was completed in September 2001.	File Closed

Table E-1. Environmental Restoration Program Sites at Santa Rosa Island Cont'd

Site Designation	Site Name	Site Location	Site Description	Site Status
POI-356	A-11 Storage Bunkers Underground Storage Tank	A-11 Compound, SRI	The exposed top of a corroded storage tank was identified. No soil impacts were identified. TRPH was detected at a low concentration below the Florida soil cleanup target levels for both residential and industrial soils. The partially buried tank was removed from the site in September 1998.	File Closed
POI-405	Test Area A-15	A-15	Site was identified as a BOMARC missile fragment disposal area. The missile debris and other material, was uncovered and radioactive debris was separated and placed in approved boxes. In early 1993, the BOMARC missile debris was removed. Scoping surveys have identified Mg-Thor at three locations on site.	File Closed with Internal Land Use Controls (96CEG/CEVR must be contacted prior to activities around the site).
POI-501	Former A-7 Radar Facility POL Site	SRI Former A-7 Compound	The former A-7 Radar Facility suffered extensive damage due to Hurricane Opal in October 1995. The site encompasses an area of approximately 15 feet by 15 feet and is identified by several deteriorated oil filters and yellow-brown stained soils. Eglin excavated impacted soils and disposed of them appropriately off site.	File Closed

Source: USAF, 2003; Bjorkland, 2006

AOC = Area of Concern; AST = Aboveground Storage Tank; ERP = Environmental Restoration Program; NFA = No Further Action; PCB = Polychlorinated Biphenyl; POI = Point of Interest; POL = Petroleum, Oil, and Lubricants; SI = Site Investigation; SRI = Santa Rosa Island; TRPH = Total Recoverable Petroleum Hydrocarbons; UST = Underground Storage Tank

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APPENDIX F

FEDERAL AGENCY COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY DETERMINATIONS

FEDERAL AGENCY COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY DETERMINATION

Introduction

This document provides the state of Florida with the U.S. Air Force's Consistency Determination under CZMA Section 307 and 15 C.F.R. Part 930 sub-part C. The information in this Consistency Determination is provided pursuant to 15 C.F.R. Section 930.39 and Section 307 of the Coastal Zone Management Act, 16 U.S.C. § 1456, as amended, and its implementing regulations at 15 C.F.R. Part 930.

This federal consistency determination addresses the proposed activities described within the Immediate Storm Surge Protection for Santa Rosa Island (SRI) Facilities, Eglin Air Force Base (AFB), FL Environmental Assessment (EA), Chapter 2 of the EA.

Proposed Federal Agency Action

The U.S. Air Force (USAF) proposes to provide immediate severe storm event (i.e., tropical storms, hurricanes, etc.) protection to mission-critical test facilities at SRI Range Complex at Eglin AFB, FL (Figure 1-1 in the EA). Many test sites have experienced severe erosion and varying degrees of facilities foundation undermining and damage as a result of Hurricane Ivan (Sep 04), Tropical Storm Arlene (Jun 05), Hurricane Dennis (Jul 05) and Hurricane Katrina (Aug 05). Protection from wave action and storm surge is crucial to maintaining national security and testing capabilities. Without it, partial or complete destruction of testing sites and/or supporting infrastructure would likely occur during future severe weather events.

In the Florida State Clearinghouse letter dated 3 August 2005 for temporary seawall repair, the Florida Department of Environmental Protection (FDEP), Bureau of Beaches and Coastal Systems advised, "the utilization of concrete debris to construct/stabilize the seawalls may not withstand significant wave-action, due to the small size of the material." After evaluation of this recommendation, Eglin AFB believes that in order to maintain the test infrastructure on SRI with uninterrupted access to the unique capabilities it possesses, it is necessary to provide immediate storm protection for specific test sites on SRI through the repair and construction of seawalls and bulkheads. The repair and construction of seawalls and bulkheads would serve to channel storm surge energy away from facilities at respective sites and protect critical SRI facilities. Eglin AFB also acknowledges the recommendations of the Florida Fish and Wildlife Conservation Commission (FWC) from the same letter dated 3 August 2005. In this letter, it was suggested that beach and dune restoration through the addition of clean sand and/or vegetation planting should be considered as an alternative and long-term solution. However, due to the scope of such a project and lengthy permitting phases, it would not provide the immediate protection of assets that is required. Land mass restoration through dune construction and sand replenishment is considered a reasonably foreseeable future action, and is addressed as such in Chapter 5 of the EA.

The Proposed Action is to repair, replace, and extend existing seawalls or construct new seawalls and bulkheads to protect seven mission-critical Test Sites (TS): A-3, A-3½, A-6, A-11, A-13, A-13B, and A-18. In addition, a new concrete pad would be constructed at TS A-3½. These projects include:

- Replace the seawall at TS A-3.
- Construct a new concrete pad and bulkhead at TS A-3½.
- Construct a new bulkhead at TS A-6.
- Repair and extend the seawall at TS A-11.
- Repair and extend the seawall at TS A-13.
- Construct a new seawall at TS A-13B.
- Construct a new bulkhead at TS A-18.

Figures 2-1 through 2-9 in the EA identify the proposed seawall locations in relation to existing seawalls and other structures. Figures 1-2 through 1-8 in the EA show existing or proposed construction at each location as well as demonstrate the need for the proposed action. The Air Force would implement the Proposed Action prior to the 2006 Hurricane Season, which begins June 1, in order to protect the facilities most at risk from storm surge.

Seawall and Bulkhead Repair and Construction at Test Sites A-3, A-11, A-13, A-13B and A-18

Upon completion, each new or repaired and extended seawall would be 500 feet in length along the Gulf front with two adjoining walls, also 500 feet in length (Figure 2-6 in the EA). The seawalls would consist of 40 foot steel sheet piles capped with a continuous 3 x 3 foot reinforced concrete beam and encased with reinforced concrete varying in heights from 12 to 17 feet (Figure 2-7 in the EA). The United States Army Corps of Engineers (USACE) would deposit approximately 3,500 cubic yards of sand as backfill behind the sheet pile, and would place large rocks on the seaward side of the wall to help dissipate energy from breaking waves (Figure 2-7 in the EA). The total length of new and repaired seawall or bulkhead would be 8,000 linear feet. The USACE would demolish approximately 1,610 feet of existing damaged seawall at TS A-3 and A-11.

New Concrete Pad and Bulkhead at A-3½

The Air Force would construct a 4,885 square foot concrete equipment pad at TS A-3½ (Figure 2-10 in the EA). The concrete pad would support mobile radar equipment and heavy truck loads. The concrete pad would be 12 inches thick with 2 layers of 8-inch steel and an underlying base of 8 inches of crushed rock. The crushed rock would be environmentally safe. The Air Force would also construct an access road 180 feet long by 12 feet wide, composed of 6-inch thick crushed rock, and place approximately 10,000 cubic yards of compatible beach sand around the existing site. The Air Force would construct a concrete bulkhead at the TS extending vertically down from the perimeter of the concrete pad.

Bulkhead Construction at A-6

The bulkhead proposed for TS A-6 would be approximately 6 feet high (Figure 2-8 in the EA), 750 feet in length, and encompass the south, east and west sides of the facility, including the access road.

Federal Consistency Review

Statutes addressed as part of the Florida Coastal Zone Management Program consistency review and considered in the analysis of the Proposed Action are discussed in the following table.

Pursuant to 15 C.F.R. § 930.41, the Florida State Clearinghouse has 60 days from receipt of this document in which to concur with or object to this Consistency Determination, or to request an extension, in writing, under 15 C.F.R. § 930.41(b). Florida's concurrence would be presumed if Eglin AFB does not receive its response on the 60th day from receipt of this determination.

Florida Coastal Management Program Consistency Review

Statute	Consistency	Scope
Chapter 161 *Beach and Shore Preservation*	While the proposed project would occur within state waters, or along existing easements, best management practices would be implemented to ensure that actions would not adversely affect beach and shore management, specifically as it pertains to: • The Coastal Construction Permit Program. • The Coastal Construction Control Line (CCCL) Permit Program. • The Coastal Zone Protection Program.	Authorizes the Bureau of Beaches and Coastal Systems within FDEP to regulate construction on or seaward of the states' beaches.
Chapter 163, Part II *Growth Policy; County and Municipal Planning; Land Development Regulation*	The Proposed Action would not affect local government comprehensive plans.	Requires local governments to prepare, adopt, and implement comprehensive plans that encourage the most appropriate use of land and natural resources in a manner consistent with the public interest.
Chapter 186 *State and Regional Planning*	The Proposed Action would not have a negative affect on state plans for water use, land development or transportation.	Details state-level planning requirements. Requires the development of special statewide plans governing water use, land development, and transportation.
Chapter 252 *Emergency Management*	The Proposed Action would not increase the state's vulnerability to natural disasters. The Proposed Action would not impact emergency response and evacuation procedures.	Provides for planning and implementation of the state's response to, efforts to recover from, and the mitigation of natural and manmade disasters.

Florida Coastal Management Program Consistency Review Cont'd

Statute	Consistency	Scope
Chapter 253 *State Lands*	A JCP)would be filed with the FDEP, the USACE, and the Northwest Florida Water Management District, for construction and repair activities seaward of the Mean High Water Line, prior to project initiation.	Addresses the state's administration of public lands and property of this state and provides direction regarding the acquisition, disposal, and management of all state lands.
Chapter 258 *State Parks and Preserves* Chapter 259 *Land Acquisition for Conservation or Recreation* Chapter 260 *Recreational Trails System* Chapter 375 *Multipurpose Outdoor Recreation; Land Acquisition, Management, and Conservation*	The Proposed Action would not affect state parks, recreational areas and aquatic preserves. The Proposed Action would not affect tourism and outdoor recreation. The Proposed Action would not affect opportunities for recreation on state lands. Equipment may temporarily affect tourism and outdoor recreation during installation, however, as existing easements are being utilized, the Air Force does not anticipate any restrictions to beach access. The Proposed Action would have no negative impacts to public recreation.	Addresses administration and management of state parks and preserves (Chapter 258). Authorizes acquisition of environmentally endangered lands and outdoor recreation lands (Chapter 259). Authorizes acquisition of land to create a recreational trails system and to facilitate management of the system (Chapter 260). Develops comprehensive multipurpose outdoor recreation plan to document recreational supply and demand, describe current recreational opportunities, estimate need for additional recreational opportunities, and propose means to meet the identified needs (Chapter 375).
Chapter 267 *Historical Resources*	All known historical resource areas are fenced, marked, and would be avoided during installations and repairs; archaeological consultations would not be required. If during the installation phase a potential historical resource is uncovered, work would cease immediately and 96 CEG/CEVH would be contacted. Consultation with the Florida State Historic Preservation Office (SHPO) would be completed before project is reinitiated. For more information, refer to sections 3.8 and 4.8 of the EA.	Addresses management and preservation of the state's archaeological and historical resources.
Chapter 288 *Commercial Development and Capital Improvements*	The Proposed Action is not anticipated to have any effect on future business opportunities on state lands, or the promotion of tourism in the region.	Provides the framework for promoting and developing the general business, trade, and tourism components of the state economy.
Chapter 334 *Transportation Administration* Chapter 339 *Transportation Finance and Planning*	The Proposed Action would not have an impact on transportation. The Proposed Action would have no effect on the finance and planning needs of the state's transportation system.	Addresses the state's policy concerning transportation administration (Chapter 334). Addresses the finance and planning needs of the state's transportation system (Chapter 339).

Florida Coastal Management Program Consistency Review Cont'd

Statute	Consistency	Scope
Chapter 370 *Saltwater Fisheries*	The Proposed Action would not affect saltwater fisheries.	Addresses management and protection of the state's saltwater fisheries.
Chapter 372 *Wildlife*	In accordance with Section 7 of the Endangered Species Act, a Formal Consultation with the United States Fish and Wildlife Service (USFWS) would be completed prior to project initiation. The action agency would comply with all terms and conditions of the biological opinion and avoidance and minimization measures outlined within the Section 7 consultation. These terms and conditions, as well as avoidance and minimization measures would minimize potential impacts to state and federally listed species.	Addresses the management of the wildlife resources of the state.
Chapter 373 *Water Resources*	Coordination with Environmental Engineering Section of Eglin Environmental Management (96 CEG/CEVCE) is required to determine permitting requirements for structural, irrigation, backflow preventer, and storm water designs prior to the implementation of the Proposed Action. Impervious surface area would increase resulting in an increase in stormwater runoff. A Notice of Intent to Use the General Permit for New Stormwater Discharge Facility Construction must be submitted prior to project initiation (FAC 62-25). The Proposed Action would require coverage under the Generic Permit for Stormwater Discharge from Construction Activities that Disturb One or More Acres of Land (FAC 62-621) since more than one acre would be disturbed. Wetlands would not be disturbed. Construction activities must be performed in compliance with 62-550 F.A.C., 62-55 F.A.C., 62-604 F.A.C., American Water Works Association (AWWA) Standards, Ten State Standards, and Water Management District laws and permits.	Addresses the state's policy concerning water resources.
Chapter 376 *Pollutant Discharge Prevention and Removal*	All handling of fuels would be in accordance with applicable federal, state, and Air Force regulations, which include AFI 23-201, Fuels Management. Should a pollutant spill occur during refueling or project related activities, the presence of spill response equipment would ensure quick response by on-site personnel. With the proper management requirements in place, the Air Force does not anticipate	Regulates transfer, storage, and transportation of pollutants, and cleanup of pollutant discharges.

Florida Coastal Management Program Consistency Review Cont'd

Statute	Consistency	Scope
	significant impacts from hazardous materials and waste associated with the Proposed Action. For additional information regarding Fuel Management requirements, refer to section 4.7 of the EA.	
Chapter 377 *Energy Resources*	The Proposed Action would not affect energy resource production, including oil and gas, and the transportation of oil and gas.	Addresses regulation, planning, and development of energy resources of the state.
Chapter 380 *Land and Water Management*	Under the Proposed Action, development of state lands with regional (i.e., more than one county) impacts would not occur. The Proposed Action would not affect areas of Critical State Concern or areas with approved state resource management plans such as the Northwest Florida Coast. Changes to coastal infrastructure would occur with repairs and/or construction of seawalls along the Santa Rosa Barrier Island Coast. Capacity increases of existing coastal infrastructure, or use of state funds for infrastructure planning, designing or construction would not occur.	Establishes land and water management policies to guide and coordinate local decisions relating to growth and development.
Chapter 381 *Public Health, General Provisions*	The Proposed Action does not involve the construction of an on-site sewage treatment and disposal system. An Extension Permit for Water and Wastewater Systems (FAC 62-555 and 62-600) would be required prior to construction.	Establishes public policy concerning the state's public health system.
Chapter 388 *Mosquito Control*	The Proposed Action would not affect mosquito control efforts.	Addresses mosquito control effort in the state.
Chapter 403 *Environmental Control*	The Proposed Action would not affect ecological systems and water quality of state waters. Combustive emissions and fugitive dust from construction would be temporary. Air quality criteria would not be exceeded and the impacts would not be significant.	Establishes public policy concerning environmental control in the state.
Chapter 582 *Soil and Water Conservation*	Impacts to soils would not be significant. Erosion would be controlled through construction best management practices.	Provides for the control and prevention of soil erosion.

APPENDIX G

AGENCY COORDINATION AND CONSULTATIONS

AGENCY COORDINATION AND CONSULTATIONS

Agency coordination for the Proposed Action included Florida State Clearinghouse Review and consultation with the USFWS. During the Florida State Clearinghouse Review, the West Florida Regional Planning Council, the Fish and Wildlife Conservation Commission, the Florida Department of State, the Department of Environmental Protection, the Division of Historical Resources, and the Northwest Florida Water Management District reviewed the EA. The State Clearinghouse review includes the state's determination that the action is consistent with the Florida Coastal Zone Management Program. The State Clearinghouse Review is provided as Attachment G-1.

The Air Force initiated consultation with the USFWS for potential effects from the Proposed Action to federally protected threatened and endangered species. The USFWS issued a biological opinion, which is provided as Attachment G-2.

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ATTACHMENT G-1

STATE CLEARINGHOUSE REVIEW

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Department of Environmental Protection

Jeb Bush
Governor

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Colleen M. Castille
Secretary

April 14, 2006

Mr. Alvin G. Jordan
96 CEG/CEVS
Department of the Air Force
501 DeLeon Street, Suite 101
Eglin AFB, FL 32542-5133

RE: Department of the Air Force – Draft Environmental Assessment for Immediate Storm Surge Protection for Santa Rosa Island Facilities, Eglin Air Force Base – Okaloosa and Santa Rosa Counties, Florida.
SAI # FL200603071978C

Dear Mr. Jordan:

The Florida State Clearinghouse, pursuant to Presidential Executive Order 12372, Gubernatorial Executive Order 95-359, the Coastal Zone Management Act, 16 U.S.C. §1451-1464, as amended, and the National Environmental Policy Act, 42 U.S.C. § 4321, 4331-4335, 4341-4347, as amended, has coordinated a review of the draft environmental assessment (EA).

The Florida Department of Environmental Protection (DEP), Bureau of Beaches and Coastal Systems advises that a Joint Coastal Permit (JCP) will be required for work seaward of the mean high water (MHW) line. Seawalls and revetments that extend seaward of the MHW line may cause significant adverse impacts to the surrounding beach system and turtle habitat through toe scour and downdrift erosion. Bureau staff has requested additional information on the site and design features of the proposed structures to evaluate the potential impacts of the project and process the necessary JCP. The Bureau recommends that, if feasible, the existing facilities and new seawalls should be relocated as far landward as practical to avoid or minimize adverse impacts to the beach-dune system. Please see the enclosed DEP memorandum for additional comments and recommendations.

The Florida Fish and Wildlife Conservation Commission (FWC) recommends that avoidance and minimization measures detailed in a U.S. Fish and Wildlife Service biological opinion, dated December 1, 2005, of the SRI mission utilization plan be followed during construction. Should other state-listed species be encountered prior to or during construction, or if the project is expected to disturb, harm, result in capture, or take of state-listed species, their nests, or eggs, the applicant should visit the FWC's permit website for information on permit application requirements. Please refer to the enclosed FWC letter for further details.

Based on the information contained in the draft EA and the enclosed state agency comments, the state has determined that, at this stage, the proposed activities are consistent with the Florida Coastal Management Program (FCMP). The federal agency must, however, address the concerns identified by DEP and FWC staff prior to project implementation. The state's continued concurrence with the project will be based, in part, on the adequate resolution of issues identified during this and subsequent reviews. The state's final concurrence of the project's consistency with the FCMP will be determined during the environmental permitting stage.

Thank you for the opportunity to review the proposed project. Should you have any questions regarding this letter, please contact Ms. Lauren P. Milligan at (850) 245-2170.

Yours sincerely,

Sally B. Mann

Sally B. Mann, Director
Office of Intergovernmental Programs

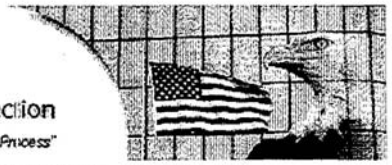
SBM/lm

Enclosures

cc: Roxane Dow, DEP, BBCS
Mary Ann Poole, FWC

Florida
Department of Environmental Protection

"More Protection, Less Process"



Project Information	
Project:	FL200603071978C
Comments Due:	04/03/2006
Letter Due:	04/14/2006
Description:	DEPARTMENT OF THE AIR FORCE - DRAFT ENVIRONMENTAL ASSESSMENT FOR IMMEDIATE STORM SURGE PROTECTION FOR SANTA ROSA ISLAND FACILITIES, EGLIN AIR FORCE BASE - OKALOOSA AND SANTA ROSA COUNTIES, FLORIDA.
Keywords:	USAF - STORM SURGE PROTECTION FOR SANTA ROSA ISLAND FACILITIES, EGLIN AFB
CFDA #:	12.200

Agency Comments:
WEST FLORIDA RPC - WEST FLORIDA REGIONAL PLANNING COUNCIL
No Comments - Generally consistent with the West Florida Strategic Regional Policy Plan.
OKALOOSA - OKALOOSA COUNTY
No Comment
SANTA ROSA - SANTA ROSA COUNTY
No Comment
FISH and WILDLIFE COMMISSION - FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION
FWC recommends that avoidance and minimization measures detailed n a U.S. Fish and Wildlife Service biological opinion, dated December 1, 2005, of the SRI mission utilization plan be followed during construction. Should other state-listed species be encountered prior to or during construction, or if the project is expected to disturb, harm, result in capture, or take of state-listed species, their nests, or eggs, the applicant should visit the FWC's permit website for information on permit application requirements.
STATE - FLORIDA DEPARTMENT OF STATE
No Comment/Consistent
ENVIRONMENTAL PROTECTION - FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
The DEP Bureau of Beaches and Coastal Systems advises that a Joint Coastal Permit (JCP) will be required for work seaward of the mean high water (MHW) line. Seawalls and revetments that extend seaward of the MHW line may cause significant adverse impacts to the surrounding beach system and turtle habitat through toe scour and downdrift erosion. Bureau staff has requested additional information on the site and design features of the proposed structures to evaluate the potential impacts of the project and process the necessary JCP. The Bureau recommends that, if feasible, the existing facilities and new seawalls should be relocated as far landward as practical to avoid or minimize adverse impacts to the beach-dune system.
NORTHWEST FLORIDA WMD - NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT
No Comment

For more information please contact the Clearinghouse Office at:

3900 COMMONWEALTH BOULEVARD MS-47
TALLAHASSEE, FLORIDA 32399-3000
TELEPHONE: (850) 245-2161
FAX: (850) 245-2190

Visit the Clearinghouse Home Page to query other projects.

Florida Department of
Memorandum **Environmental Protection**

TO: Florida State Clearinghouse

FROM: Roxane Dow
Bureau of Beaches and Coastal Systems

DATE: April 14, 2006

SUBJECT: Draft Environmental Assessment (EA) for Immediate Storm Surge Protection for Santa Rosa Island Facilities, Eglin Air Force Base, Florida.
SAI # FL06-1978C

The DEP Bureau of Beaches and Coastal Systems' Joint Coastal Permitting Section offers the following comments:

- The facilities need to be moved landward, and any application for "temporary" seawall repairs must include long range plans to relocate the facilities.
- A Joint Coastal Permit (JCP) will be required for work seaward of the MHW line.
- We are not allowed to issue a JCP that will result in significant adverse impacts.
- Seawalls and revetments that extend seaward of the MHW line will cause adverse impacts to the surrounding beach system through toe scour and downdrift erosion. Evaluation of these impacts may indicate that the project will cause significant adverse impacts.
- These physical impacts will cause adverse impacts to turtle habitat. Evaluation of impacts to turtle habitat may indicate that the project will cause significant adverse impacts (Take).
- I expect that a Biological Opinion from USFWS will be required.
- The drawing in the EA didn't provide enough detail to evaluate the impacts. We will need plan view and cross-sectional drawings for each site that show the MHW and MLW lines, elevations, existing vs. proposed conditions, scale, upland topographic interval lines (including any dunes), and bathymetric interval lines (including sandbars/shoals).
- Even if the application is for a JCP, the structures would still have to satisfy the Coastal Construction Control Line (CCCL) permit engineering criteria.
- We will try to expedite our review, but that will require sufficient information to enable the following groups to provide their comments: Florida Fish and Wildlife Conservation Commission, State Historic Preservation Officer, U.S. Fish and Wildlife Service, CCCL engineer, and our Coastal Engineering Section.

For further information and assistance, please contact Mr. Marty Seeling at (850) 414-7728.

The Coastal Engineering Section has provided the following comments:

Pursuant to Section 161.041(2), Florida Statutes, the DEP may authorize an excavation or erection of a structure at any coastal location seaward of the mean high water line upon receipt of an application from a property or riparian owner and upon consideration of facts and circumstances, including: (a) Adequate engineering data concerning inlet and shoreline stability and storm tides related to shoreline topography; (b) Design features of the proposed structures or activities; and (c) Potential impacts of the location of such structures or activities, including potential cumulative effects of any proposed structures or activities upon such beach-dune system or coastal inlet, which, in the opinion of the DEP, clearly justify such a permit.

The Proposed Action is to initiate immediate and temporary severe storm event (i.e., tropical storms, hurricanes) protection to mission-critical test facilities at Santa Rosa Island Range Complex at Eglin AFB, Florida. The Air Force would: 1) repair, extend and replace existing seawalls and 2) construct new seawalls and bulkheads.

A determination of consistency or inconsistency with Section 161.041, F.S., is not possible because the EA contains insufficient information on the design features of the Proposed Action to consider and assess the potential impacts on the beach-dune system. Based upon the information contained in the draft EA, I have the following comments regarding the design features (specifically, siting relative to the active beach and mean high water line) that would be considered if the Proposed Action required a JCP pursuant to Section 161.041, F.S., and the implementing Rule 62B-41, Florida Administrative Code. The individual facilities and the Proposed Action at each is listed below along with my comments.

Construct New Concrete Pad and Bulkhead at Test Site A-3 ½
The Air Force would construct a 4,885 square foot concrete equipment pad at TS A-3½. The Air Force would construct a concrete bulkhead extending vertically down from the perimeter of the concrete pad. Presently, there does not appear to be any existing structures at this site and sufficient space is available to locate the proposed structures landward of the mean high water line, and hence, outside the JCP jurisdiction of DEP. Consequently, there does not appear to be justification for approval of a JCP based upon the potential adverse impacts to the beach-dune system that would result from locating the proposed structure(s) seaward of the mean high water line. It is recommended that the structures be sited as far landward as practical to minimize adverse impacts to the beach-dune system that would occur when storm tides and waves are great enough to reach the structures.

Repair and Extend Damaged Seawalls at Test Sites A-3, A-11, and A-13
These sites were inspected on August 10, 2005. The existing walls are substantially damaged. Repair will involve demolition of the existing walls at TS A-3 and A-11 and installation of new steel sheet pile walls and rock toe scour protection. There appears to be adequate space available to relocate the new structures landward of the mean high water in order to minimize adverse

impacts to the beach-dune system. This will also locate the new structures landward of the mean high water line, and hence, outside the JCP jurisdiction of DEP.

The draft EA does not indicate that the existing wall at TS A-13 is to be demolished and replaced. Placement of rock toe scour protection seaward of the existing wall at TS A-13 would extend seaward of the mean high water line and require a JCP for construction. It is recommended that existing wall at TS A-13 be demolished and the new structure be sited as far landward as practical to minimize adverse impacts to the beach-dune system.

New wall and rock structures at TS A-3 and A-11, and placement of rock toe scour protection seaward of the existing wall at TS A-13, that encroach on the active beach will interfere with alongshore littoral transport of beach sediments during normal wave conditions and cause erosion of the adjacent beach and dunes in the immediate vicinity of the structure. During storm events, the structures will increase cross-shore erosion and the formation of escarpments on the adjacent unarmored shoreline. It is recommended that the new structures be sited as far landward as practical to minimize adverse impacts to the beach-dune system.

Construct new bulkheads at TS A-6 and A-18
Based upon the aerial photomaps contained in the draft EA, these sites appear to be located over 500 feet landward of the mean high water line, and would have no effect on adjacent lands except during the most severe storm event when surge overtops the barrier island.

Construct new seawall at TS A-13B
The draft EA does not contain any information on the existing test facility at this location or its location relative to the active beach and mean high water line. If feasible, the existing facility and new seawall should be relocated as far landward as practical in order to avoid or minimize adverse impacts to the beach-dune system.

DEP staff appreciates the opportunity to review the proposal and recommends that Eglin Air Force Base continue to coordinate with the Bureau to resolve the above concerns, minimize adverse impacts, and facilitate review of the JCP application. If you have any questions or need additional information, please contact Mr. Robert Brantly, P.E., at (850) 413-7803.

FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION

MARY ANN POOLE, DIRECTOR
OFFICE OF POLICY AND STAKEHOLDER COORDINATION
(850)488-6661 TDD (850)488-9542
FAX (850)922-5679

April 12, 2006

Ms. Lauren Milligan, Clearinghouse Coordinator
Florida State Clearinghouse
Florida Department of Environmental Protection
3900 Commonwealth Boulevard, Mail Station 47
Tallahassee, FL 32399-3000

Re: Okaloosa and Santa Rosa Counties, SAI #FL200603071978C, Department of the Air Force -- Draft Environmental Assessment – Immediate Storm Surge Protection for Santa Rosa Island Facilities, Eglin Air Force Base

Dear Ms. Milligan:

The Division of Habitat and Species Conservation, Terrestrial Habitat Conservation and Restoration Section, of the Florida Fish and Wildlife Conservation Commission (FWC) has coordinated agency review of the Department of the Air Force – Draft Environmental Assessment (EA) – Immediate Storm Surge Protection for Santa Rosa Island Facilities, and provides the following comments and recommendations in accordance with the Coastal Zone Management Act/Florida Coastal Management Program and the National Environmental Policy Act (NEPA).

Project Description

The Proposed Action is to initiate immediate severe storm event protection to mission-critical test facilities. Recent tropical storms have caused severe erosion and undermined foundations of Test Site (TS) facilities, jeopardizing maintenance of military testing capabilities. The Proposed Action would include repair and extension of three damaged seawalls at TS A-3, A-11, and A-13; construction of a new concrete pad and bulkhead at TS A-3½; construction of a new seawall at TS A-13B; and construction of bulkheads at TS A-6 and A-18. The total length of the repaired seawalls or bulkheads is approximately 8,000 linear feet. Each new or repaired and extended seawall would be 500 feet in length along the Gulf front. Seawalls would consist of 40-foot steel sheet piles capped with a continuous 3-foot by 3-foot concrete beam and encased with concrete in heights varying from 12 to 17 feet. Seawalls would be backfilled with sand and faced with rock revetments.

620 South Meridian Street • Tallahassee • FL • 32399-1600
Visit MyFWC.com

Construction is intended as an immediate, but temporary measure, to protect facilities from wave action and storm surge by channeling and redirecting wave energy until long-term solutions can be developed. Implementation of the proposed action is planned for prior to the start of the 2006 hurricane season. Foreseeable future actions are likely to include land mass restoration, both beach renourishment and dune restoration. Findings of no significant impact and no practicable alternative have been issued by the Directorate of Mission Support.

Potentially Affected Resources

The following state-listed species (Chapter 68A-27, Florida Administrative Code, Rules Relating to Endangered or Threatened Species) or their habitat are associated with Santa Rosa Island (SRI) and should be considered before and during implementation of the Proposed Action: Gulf sturgeon (*Acipenser oxyrinchus desotoi*, Species of Special Concern), loggerhead sea turtle (*Caretta caretta*, Threatened), green sea turtle (*Chelonia mydas*, Endangered), leatherback sea turtle (*Dermochelys coriacea*, Endangered), Kemp's Ridley sea turtle (*Lepidochelys kempii*, Endangered), snowy plover (*Charadrius alexandrinus*, Threatened), piping plover (*Charadrius melodus*, Threatened), little blue heron (*Egretta caerulea*, Species of Special Concern), snowy egret (*Egretta thula*, Species of Special Concern), tricolor heron (*Egretta tricolor*, Species of Special Concern), white ibis (*Edocimus albus*, Species of Special Concern), black skimmer (*Rynchops niger*, Species of Special Concern), and least tern (*Sterna antillarum*, Threatened).

Concerns and Recommendations

We recommend that avoidance and minimization measures detailed in a U.S. Fish and Wildlife Service biological opinion (December 1, 2005) of the SRI mission utilization plan be followed during construction. Should other state-listed species be encountered prior to or during construction or if the project is expected to disturb, harm, result in capture, or take of state listed species, their nests, or eggs, the applicant should visit http://myfwc.com/permits/Protected-Wildlife/ for information on permit application requirements, and contact the Wildlife Permit Coordinator within the Division of Habitat and Species Conservation with specific permitting questions.

For species listed prior to 1999: The FWC may issue permits for species listed as "Endangered" only if the permitted activity will clearly enhance the survival potential of the species. For species that are classified as "Threatened", the FWC may issue a permit only for scientific or conservation purposes and only upon a showing by the applicant that the permitted activity will not have a negative impact on the survival potential of the species. For species that are classified as "Species of Special Concern", permits may be issued upon reasonable conclusion that the permitted activity will not be detrimental to the survival potential of the species. Additional information can be found in Chapter 68A-27, Florida Administrative Code.

For species listed after 1999: Species-specific rules should be followed. A list of these species may be found in sections 68A-27.003, .004, and .005, Florida Administrative Code.

Summary

The Draft Final Environmental Assessment is determined to be consistent with our authorities (Chapters 370 and 372, Florida Statutes) under the Florida Coastal Management Program. If you or your staff would like to coordinate further on the recommendations contained in this report, please contact me at 850-488-6661, or email me at marvann.poole@MyFWC.com, and I will be glad to help make the necessary arrangements. If your staff has any specific questions regarding our comments, I encourage them to contact Mr. Billy Sermons at our office in Panama City (850-265-3677; email billy.sermons@myfwc.com).

Sincerely,

Mary Ann Poole

Mary Ann Poole, Director
Office of Policy and Stakeholder Coord.

map/wos
ENV 1-3-2
FL2006030719780 storm surge protection at eglin
cc: Gail Carmody, USFWS-Panama City
Daniel Robeen, Eglin AFB Stewardship Division

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ATTACHMENT G-2

USFWS BIOLOGICAL OPINION

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Eglin Air Force Base
Santa Rosa Island
Storm Protection

Biological Opinion
June 15, 2006

Prepared by:
U.S. Fish and Wildlife Service
1601 Balboa Avenue
Panama City, FL

Table of Contents

Figures and Tables

United States Department of the Interior

FISH AND WILDLIFE SERVICE

1601 Balboa Avenue
Panama City, FL 32405-3721

Tel: (850) 769-0552
Fax: (850) 763-2177

June 15, 2006

Mr. Stephen M. Seiber
Chief, Eglin Natural Resources
96CEG/CEVSN
501 DeLeon Street, Suite 101
Eglin Air Force Base, Florida 32542-5133

Attn: Bob Miller

Re: FWS Log No. 4-P-05-241
Date Started: March 10, 2006
Project Title: Santa Rosa Island Storm Protection, Eglin Air Force
Ecosystem: NE Gulf
County: Okaloosa County, Florida

Dear Mr. Seiber:

Enclosed is the Fish and Wildlife Service's (Service) final biological opinion (BO) on the effect of installing storm protection structures at critical test facilities on Eglin Air Force Base (Eglin), Florida and its effects on endangered and threatened nesting loggerhead, green, leatherback, and Kemp's Ridley sea turtles. The Service concurs that the proposed action is not likely to adversely affect West Indian manatee, non-breeding piping plover, or the Florida perforate lichen and would not adversely modify designated critical habitat for the piping plover based on Eglin's commitment to incorporate measures to avoid and minimize impacts to these species (**Table 1**). This opinion is provided in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). We have assigned log number FWS 4-P-05-241 to this consultation.

This biological opinion is based on information provided in the Immediate Storm Surge Protection for Santa Rosa Island Facilities, Eglin Air Force Base, Florida Biological Assessment (BA) dated March 2006, Final Beach Management Plan dated March 2006, supplemental information supplied by Eglin or contained in our files, and meetings and discussions with Eglin Natural Resources staff (NRS). A complete administrative record of this consultation is on file in the Service's Panama City, Florida Field Office.

Table 1: Species and critical habitat evaluated for effects from the proposed action but not discussed further in this biological opinion.

SPECIES OR CRITICAL HABITAT	PRESENT IN ACTION AREA	PRESENT IN ACTION AREA BUT "NOT LIKELY TO ADVERSELY AFFECT"
Piping plover	Yes	Yes
West Indian Manatee	Yes	Yes
Florida Perforate lichen	Yes (not in the immediate Action Area)	Yes

Consultation History

May 20, 2005 — The Service receives a request from Eglin for informal consultation and a concurrence with determination of Not Likely to Adversely Affect (NLAA) for post Hurricane Ivan non-structural facility repairs on Santa Rosa Island (SRI).

May 20, 2005 — The Service receives a request from Eglin for formal consultation for facility structural repair on SRI. A supporting biological assessment (BA) was provided in the request.

June 22, 2005 — The Service provides a concurrence with a determination of NLAA by Eglin for post Hurricane Ivan non-structural facility repairs on SRI.

July 2005 — The Service receives a request by Eglin to amend the formal consultation to include structure repair of SRI facilities post Hurricane Dennis.

August 3, 2005 — The Service provides an emergency consultation for Eglin on post Hurricane Ivan and Dennis repair activities on SRI. The consultation provided for work only during the 2005 sea turtle nesting season.

August 24, 2005 — The Service provides comments via e-mail about facility storm protection and results of discussions with the Florida Department of Environmental Protection (FDEP).

August 26, 2005 — The Service receives additional information via e-mail about the proposed facility storm protection from Eglin.

August 26, 2005 — The Service receives a request for concurrence of a NLAA determination for interim storm protection efforts at the SRI facilities.

August 31, 2005	The Services corresponds with FDEP via e-mail about the proposed facility storm protection.
August 31, 2005	The Service provides a concurrence via e-mail with a determination of NLAA by Eglin on interim storm protection measures for the SRI facilities.
January 5, 2006	The Service attends an interagency meeting at Eglin AFB about the proposed facility protection.
March 10, 2006	Eglin provides the Service with a request for (reinitiation) formal section 7 consultation for the storm protection structures at critical test facilities on SRI. A supporting biological assessment (BA) and Beach Management Plan was provided in the request.
March 13, 2006	The Service receives the request for section 7 consultation.
April 13, 2006	The Service transmits a letter to Eglin acknowledging and concurs with request for formal consultation.
May 15, 2006	The Service receives comments from Eglin via e-mail on the draft biological opinion and concurs that the document can be finalized.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The objective of the proposed action is to maintain the test facility infrastructure on Santa Rosa Island (SRI) Complex at Eglin Air Force Base (**Figure 1**) with uninterrupted access to the unique capabilities it possesses. The proposed work is to initiate immediate and temporary severe storm event protection to mission-critical test facilities on SRI. The proposed work would involve: 1) existing seawall repair, replacement, and extension, and 2) construction of new seawalls and bulkheads. The Air Force proposes to begin installing the protection measures prior to the 2006 Hurricane season which begins on June 1. The proposed action would allow the Air Force to provide immediate but temporary protection to critical SRI facilities until a long-term solution can be developed. However, installation is expected to continue into the 2006 and possibly the 2007 sea turtle nesting season.

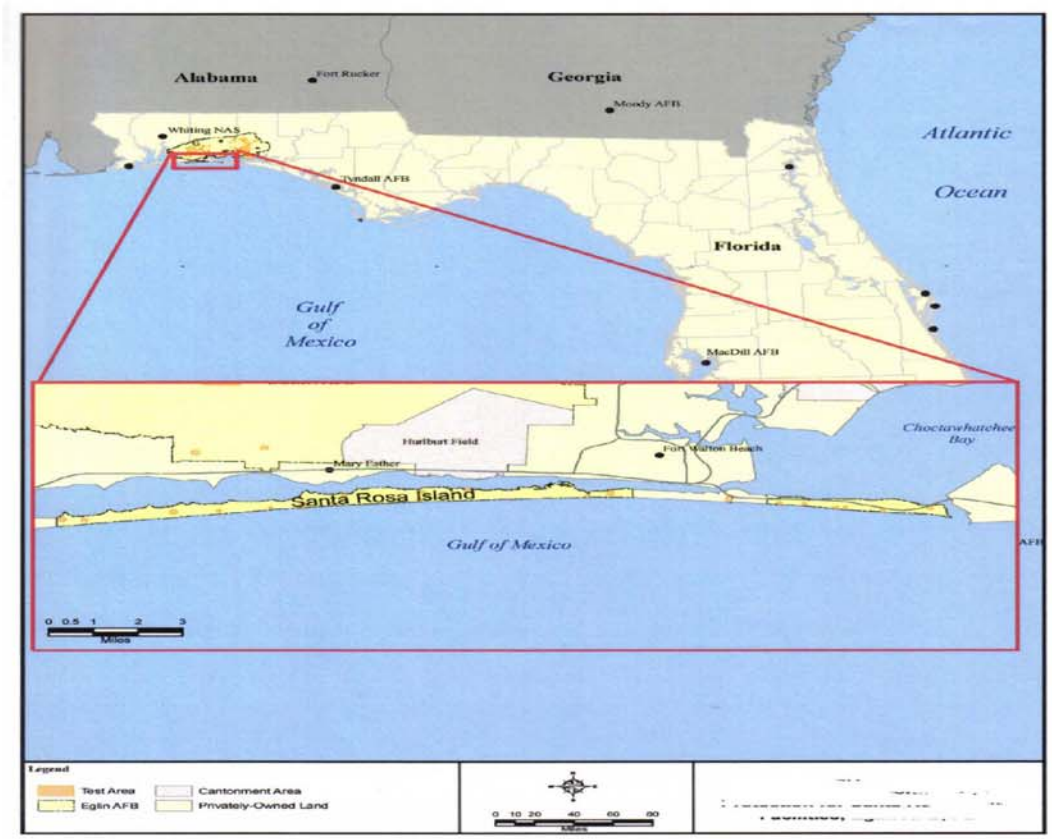

Figure 1: Location of project Santa Rosa Island on Eglin Air Force Base.

Under the proposed action, the Air Force would accomplish the following construction at these Test Sites (the BA contains detailed discussion of the repairs or new work to be performed):

- Replace the seawall at Test Site A-3. Site A-3 is a critical facility with unobstructed line of sight for key radar/optical tracking and flight termination instrumentation from sea level to high altitude.

- Construct a new concrete pad and bulkhead at Test Site A-3½.

- Construct a new bulkhead at Test Site A-6.

- Repair and extend the seawall at Test Site A-11. Site A-11 provides the only unobstructed Department of Defense (DOD) line of sight from sea level to high altitude for threat early warning and air defense systems for the specific unique threat system integrated into that facility.

- Repair and extend the seawall at Test Site A-13.

- Construct a new seawall at Test Site A-13B. Site A-13B provides the only DOD structure capable of sea-level testing of surface and airborne seekers and sensors used in missile guidance/detection systems in a humid, sub-tropical environment.

- Construct a bulkhead at Test Site A-18.

Eglin needs to maintain their current national security and testing support infrastructure with uninterrupted and unencumbered capabilities and mission support for the Air Force and DOD. Continually decreasing land mass on SRI from successive storm events in 2004 and 2005 has subjected test sites and supporting infrastructure to ever increasing damage. Many test sites have experienced severe erosion and varying degrees of facilities foundation undermining and damage as a result of Hurricane Ivan (2004), Tropical Storm Arlene (2005), Hurricane Dennis (2005) and Hurricane Katrina (2005). Test sites which were located 100-plus yards from the mean high water line (MHW) in 1995, are now in many locations only yards away from the MHW. The existing seawall at Test Site A-3 has failed and portions of the seawall no longer exist. Test Site A-11 was recently condemned after sand eroded from under its foundation after Hurricane Katrina's storm surge. Test Site A-13 experienced severe erosion and, as a result, there is a 30-foot gap in the seawall. Storm surge erosion has exposed the rear of the wall and support braces have failed or are no longer present. Erosion has progressed to the facility foundation at Test Site A-13 and the facility is in danger of complete destruction in future storms. The utility waterline between Test Site A-15 and Test Site A-17 was damaged and testing missions at theses sites have been postponed until completion of repairs due to lack of firefighting capability. Hurricanes damaged 9.8 of 14 miles of road on the SRI Range Complex.

Protection from wave action and storm surge is crucial to maintaining testing capabilities on SRI. Without it, partial or complete destruction of testing sites and/or supporting infrastructure would likely occur during future severe weather events.

Avoidance and Minimization Measures

Eglin has proposed to implement the following avoidance and minimization measures as necessary to minimize the potential for direct physical impacts, harassment, and habitat impacts resulting from the seawall extensions and additions.

1. Sea turtles: All activity related to the seawall repair or construction activities would be conducted during daytime hours only.

2. Sea turtles: No daytime (sunrise to sunset) seawall construction beachfront activities would begin before completion of daily sea turtle nest survey and protection measures (nest marking, relocation, or evaluation) from May 1 to October 31.

3. Sea turtles: Daily morning sea turtle nest surveys would be conducted 70 days prior to construction and repair activities or by May 1, whichever is later. Surveys would continue through the end of the project or through September 1, whichever is earlier. The frequency of hatching and emerging success monitoring after September 1 would involve checking nests daily until the last nest has either hatched or reached 80 days incubation, at which time the nest will be evaluated per state permit protocol.

4. Sea turtles: All known sea turtle nests would be marked and protected in accordance with established Eglin Natural Resources and state permit protocol.

5. Sea turtles: A sea turtle nest relocation program would be implemented in areas where nests would be at risk from the seawall repair and construction activities.

6. Sea turtles: All ruts deeper than 3 inches would be removed prior to sunset during sea turtle hatching season. Rut removal may be by hand using a heavy-duty "garden" rake that penetrates no more than 3 inches deep into the sand or by towing a section of weighted chain-link fence behind a vehicle. At no time would raking occur within the marked nest area.

7. Sea turtles: All equipment will be removed from the beach in the work area at the end of the day and not left on the beach overnight.

8. Sea turtles: If it is necessary to leave work materials and debris overnight on the beachfront during peak sea turtle nesting season (June – September), barriers would be installed around the base of the materials to prevent entrapment of sea turtles.

9. Sea turtles: If a sea turtle crawl is seen on the beach with no associated marked nest, the Eglin NRS staff or appropriate turtle monitoring personnel shall be contacted immediately. Care will be taken not to disturb the crawl and/or nest site.

10. Sea turtles: No other equipment, vehicles, etc. will be allowed on the beach or dunes during the repair activities that are not essential to the construction activity.

11. Sea turtles: If a nest is laid within 0.5 mile of a work area, a series of stakes and highly visible survey ribbon or string would be installed to establish a radius surrounding the nest. No activity would occur within the nest area, nor would any activity occur that would result in impacts to the nest. Nest sites would be inspected daily to be sure nest markers remain in place and that the nest has not been disturbed.

12. Sea turtles: All personnel involved in set up or performing the work will familiarize themselves with all requirements. They should pay particular attention to the management actions.

13. Sea turtles: For work that will run past October 31, the Eglin NRS will be contacted to ensure the area is clear of any remaining sea turtle nests before work can proceed.

Action Area

The actions covered under this consultation are to occur on lands in the SRI Range Complex managed by Eglin Air Force Base. Specific areas covered under this consultation include Test Sites A-3, A-3½, A-6, A-11, A-13, A-13B, and A-18. In effect, the covered area would include: demolition of 1,610 linear feet of damaged seawall, construction or repair of approximately 8,000 linear feet of seawall, placement of rock riprap on the seaward side of the seawalls, and backfill of the seawalls with sand, and construction of a 4,885 square foot equipment pad and access road 180 feet long by 12 feet wide (**Figure 2**). The total beachfront to be affected is 1.1 miles (5,710 feet).

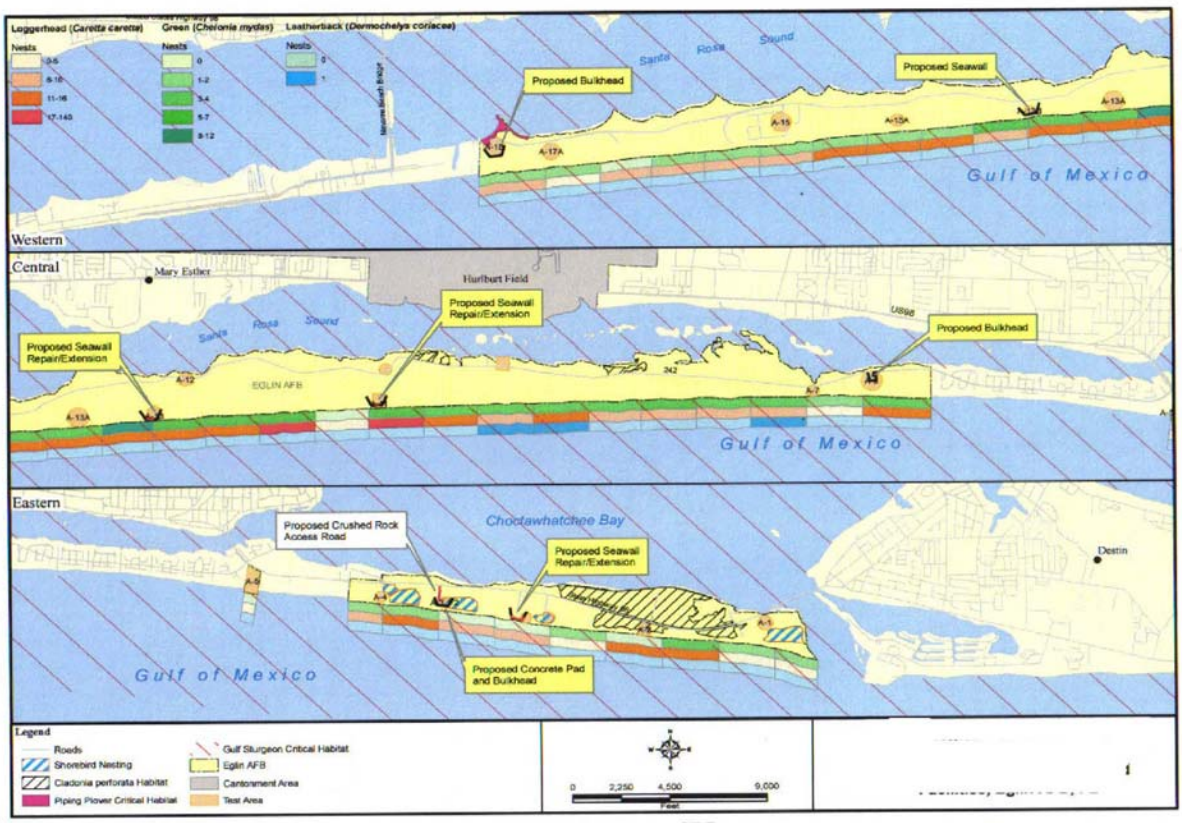

Figure 2: Location of project Action Area: Santa Rosa Island storm protection sites on Eglin Air Force Base.

Santa Rosa Island is located in the southern section of Eglin in Okaloosa County and Santa Rosa County, Florida and is a narrow barrier island approximately 50 miles long and less than 0.5 mile wide. Santa Rosa Island is separated from northwest Florida mainland by Santa Rosa Sound, a shallow lagoon varying in width from 400 to nearly 5,000 feet. Santa Rosa Island is bordered on

the south by the Gulf of Mexico and on the north by Santa Rosa Sound and on the east by Destin Pass/Choctawhatchee Bay. Eglin controls 17 miles (4,760 acres) of SRI, a 4-mile strip open for public recreation and a restricted access 13-mile section. There are 2.5 miles of Okaloosa County property between the public and restricted access parcels of Eglin property. There are a total of 15 test sites located on SRI.

Santa Rosa Island is a barrier island complex, having the typical landforms of beaches, coastal dunes, interior dunes, and low-lying sound side beaches and marshes. The beach dune and coastal strand communities are the most predominate vegetative communities present on the island.

STATUS OF THE SPECIES/CRITICAL HABITAT

The Service has the responsibility for implementing recovery of sea turtles when they come ashore to nest. This opinion addresses nesting loggerhead, green, leatherback, and Kemp's ridley turtles and hatchlings only, it does not address potential impacts of this project on sea turtles while in the open ocean. The National Oceanic and Atmospheric Administration-Fisheries (NOAA Fisheries) has jurisdiction over sea turtles in the marine environment.

Species/critical habitat description

Loggerhead Sea Turtle

The loggerhead sea turtle (*Caretta caretta*), listed as a threatened species on July 28, 1978 (43 FR 32800), inhabits the continental shelves and estuarine environments along the margins of the Atlantic, Pacific, and Indian Oceans. Loggerhead sea turtles nest within the continental U.S. from Louisiana to Virginia. Major nesting concentrations in the U.S. are found on the coastal islands of North Carolina, South Carolina, and Georgia, and on the Atlantic and Gulf coasts of Florida (Hopkins and Richardson 1984).

The loggerhead sea turtle grows to an average weight of about 200 pounds and is characterized by a large head with blunt jaws. Adults and subadults have a reddish-brown carapace. Scales on the top of the head and top of the flippers are also reddish-brown with yellow on the borders. Hatchlings are a dull brown color (National Marine Fisheries Service 2002). The loggerhead feeds on mollusks, crustaceans, fish, and other marine mammals.

Major loggerhead sea turtle nesting beaches are located in the Sultanate of Oman, southeastern U.S., and eastern Australia. The species is widely distributed within its range. It may be found hundreds of miles out to sea, as well as in inshore areas such as bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers. Coral reefs, rocky places, and ship wrecks are often used as feeding areas. Nesting occurs mainly on open beaches or along narrow bays having suitable sand, and often in association with other species of sea turtles.

Recovery Criteria for the United States

The southeastern U.S. population of the loggerhead can be considered for delisting where, over a period of 25 years, the following conditions are met:

1. The adult female population in Florida is increasing and in North Carolina, South Carolina, and Georgia, it has returned to pre-listing levels (NC - 800, SC - 10,000, and GA - 2,000 nests per season). The above conditions must be met with the data from standardized surveys which would continue for at least five years after delisting.

2. At least 25 percent (348 miles) of all available nesting beaches (1,400 miles) are in public ownership, distributed over the entire nesting range and encompassing at least 50 percent of the nesting activity in each state.

3. All priority one tasks identified in the recovery plan have been successfully implemented.

No critical habitat has been designated for the loggerhead sea turtle.

Green Sea Turtle

The green sea turtle (*Chelonia mydas*) was federally listed as a protected species on July 28, 1978 (43 FR 32800). Breeding populations of the green turtle in Florida and along the Pacific Coast of Mexico are listed as endangered; all other populations are listed as threatened. The green turtle has a worldwide distribution in tropical and subtropical waters. Major green turtle nesting colonies in the Atlantic occur on Ascension Island, Aves Island, Costa Rica, and Surinam. Within the U.S., green turtles nest in small numbers in the U.S. Virgin Islands and Puerto Rico, and in larger numbers along the east coast of Florida, particularly in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward counties (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991a). Nesting also has been documented along the Gulf coast of Florida from Escambia County through Franklin County in northwest Florida and from Pinellas County through Collier County in southwest Florida (Florida Fish and Wildlife Conservation Commission statewide nesting database). Green turtles have been known to nest in Georgia, but only on rare occasions (Georgia Department of Natural Resources statewide nesting database). The green turtle also nests sporadically in North Carolina and South Carolina (North Carolina Wildlife Resources Commission statewide nesting database; South Carolina Department of Natural Resources statewide nesting database). Unconfirmed nesting of green turtles in Alabama has also been reported (Bon Secour National Wildlife Refuge nesting reports).

The green sea turtle grows to a maximum size of about 4 feet and a weight of 440 pounds. It has a heart-shaped shell, small head, and single-clawed flippers. The carapace is smooth and colored gray, green, brown and black. Hatchlings are black on top and white on the bottom (National

Marine Fisheries Service 2002). Hatchling green turtles eat a variety of plants and animals, but adults feed almost exclusively on seagrasses and marine algae.

The green sea turtle has a worldwide distribution in tropical and subtropical waters. They are generally found in fairly shallow waters (except when migrating) inside reefs, bays, and inlets. The sea turtle is attracted to lagoons and shoals with an abundance of marine grass and algae.

Major green turtle nesting colonies in the Atlantic occur on Ascension Island, Aves Island, Costa Rica, and Surinam. Open beaches with a sloping platform and minimal disturbance are required for nesting.

Recovery Criteria for the United States

The U.S. population of green sea turtles can be considered for delisting when, over a period of 25 years, the following conditions are met:

1. The level of nesting in Florida has increased to an average of 5,000 nests per year for at least six years. Nesting data must be based on standardized surveys.

2. At least 25 percent (65 miles) of all available nesting beaches (260 miles) are in public ownership and encompass at least 50 percent of the nesting activity.

3. A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds.

4. All priority one tasks identified in the Recovery Plan have been successfully implemented.

Critical habitat for the green sea turtle has been designated for the waters surrounding Culebra Island, Puerto Rico, and its outlying keys.

Leatherback Sea Turtle

The leatherback sea turtle (*Dermochelys coriacea*), listed as an endangered species on June 2, 1970 (35 FR 8491), nests on shores of the Atlantic, Pacific and Indian Oceans. Non-breeding animals have been recorded as far north as the British Isles and the Maritime Provinces of Canada and as far south as Argentina and the Cape of Good Hope (Pritchard 1992). Nesting grounds are distributed worldwide, with the Pacific Coast of Mexico supporting the world's largest known concentration of nesting leatherbacks. The largest nesting colony in the wider Caribbean region is found in French Guiana, but nesting occurs frequently, although in lesser numbers, from Costa Rica to Columbia and in Guyana, Surinam, and Trinidad (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1992; National Research Council 1990a).

The leatherback regularly nests in the U.S. in Puerto Rico, the U.S. Virgin Islands, and along the Atlantic coast of Florida as far north as Georgia (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1992). Leatherback sea turtles have been known to nest in Georgia, South Carolina, and North Carolina, but only on rare occasions (North Carolina Wildlife Resources Commission; South Carolina Department of Natural Resources; and Georgia Department of Natural Resources statewide nesting databases). Leatherback nesting also has been reported on the northwest coast of Florida (LeBuff 1990; Florida Fish and Wildlife Conservation Commission statewide nesting database) and in southwest Florida a false crawl (non-nesting emergence) has been observed on Sanibel Island (LeBuff 1990).

This is the largest, deepest diving, and most migratory and wide ranging of all sea turtle species. The adult leatherback can reach 4 to 8 feet in length and weigh 500 to 2,000 pounds. The carapace is distinguished by a rubber-like texture, about 1.6 inches thick, made primarily of tough, oil-saturated connective tissue. Hatchlings are dorsally mostly black and are covered with tiny scales; the flippers are edged in white, and rows of white scales appear as stripes along the length of the back (National Marine Fisheries Service 2002). Jellyfish are the main staple of its diet, but it is also known to feed on sea urchins, squid, crustaceans, tunicates, fish, blue-green algae, and floating seaweed.

The leatherback sea turtle is distributed worldwide in tropical and temperate waters of the Atlantic, Pacific, and Indian Oceans. Non-breeding leatherbacks have been recorded as far north as British Columbia, Newfoundland, the British Isles, and the Maritime Provinces of Canada and as far south as Argentina and the Cape of Good Hope (Pritchard 1992).

Leatherback turtles nest on shores of the Atlantic, Pacific and Indian Oceans. Adult females require sandy nesting beaches backed with vegetation and sloped sufficiently so the distance to dry sand is limited. Their preferred beaches have proximity to deep water and generally rough seas.

Recovery Criteria for the United States

The U.S. population of leatherbacks can be considered for delisting when the following conditions are met:

1. The adult female population increases over the next 25 years, as evidenced by a statistically significant trend in the number of nests at Culebra, Puerto Rico, St. Croix, U.S. Virgin Island, and along the east coast of Florida.

2. Nesting habitat encompassing at least 75 percent of nesting activity in U.S. Virgin Islands, Puerto Rico, and Florida is in public ownership.

3. All priority one tasks identified in the recovery plan have been successfully implemented.

Marine and terrestrial critical habitat for the leatherback sea turtle has been designated at Sandy Point on the western end of the island of St. Croix, U.S. Virgin Islands (50 CFR 17.95).

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle (*Lepidochelys kempii*) was listed as endangered on December 2, 1970 (35 FR 18320). The range of the Kemp's ridley includes the Gulf coasts of Mexico and the U.S., and the Atlantic coast of North America as far north as Nova Scotia and Newfoundland. Most Kemp's ridleys nest on the coastal beaches of the Mexican states of Tamaulipas and Veracruz, although a very small number of Kemp's ridleys nest consistently along the Texas coast (Turtle Expert Working Group 1998). In addition, rare nesting events have been reported in Florida, Alabama, South Carolina, and North Carolina. Hatchlings, after leaving the nesting beach, are believed to become entrained in eddies within the Gulf of Mexico, where they are dispersed within the Gulf and Atlantic by oceanic surface currents until they reach about 7.9 inches in length, at which size they enter coastal shallow water habitats (Ogren 1989). Outside of nesting, adult Kemp's ridleys are believed to spend most of their time in the Gulf of Mexico, while juveniles and subadults also regularly occur along the eastern seaboard of the United States (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1992).

Recovery Criteria for the United States

The goal of the plan is the recovery of the population so that the species can be reduced from endangered to threatened status. The Recovery Team members feel that the criteria for a complete removal of this species from the endangered species list need not be considered now, but rather left for future revisions of the plan. Complete removal from the Federal list would certainly necessitate that some other instrument of protection, similar to the Marine Mammal Protection Act, be in place and be international in scope. Kemp's ridley can be considered for downlisting to threatened when the following four criteria are met:

1. Protection of the known nesting habitat and the water adjacent to the nesting beach (concentrating on the Ranch Nuevo area) and continuation of the bi-national project.

2. Elimination of the mortality from incidental catch from commercial shrimping in the U.S. and Mexico through the use of Turtle Excluder Devices (TEDs) and full compliance with the regulations requiring TED use.

3. Attainment of a population of at least 10,000 females nesting in a season.

4. All priority one recovery tasks in the recovery plan are successfully implemented.

No critical habitat has been designated for the Kemp's ridley sea turtle.

Life history (growth, life span, survivorship and mortality)

Loggerhead Sea Turtle

Loggerheads are known to nest from one to seven times within a nesting season (Talbert et al. 1980; Richardson and Richardson 1982; Lenarz et al. 1981, among others); the mean is approximately 4.1 (Murphy and Hopkins 1984). The interval between nesting events within a season varies around a mean of about 14 days (Dodd 1988). Mean clutch size varies from about 100 to 126 eggs along the southeastern United States coast (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b). Nesting migration intervals of 2 to 3 years are most common in loggerheads, but the number can vary from 1 to 7 years (Dodd 1988). Age at sexual maturity is believed to be about 20 to 30 years (Turtle Expert Working Group 1998).

Green Sea Turtle

Green turtles deposit from one to nine clutches within a nesting season, but the overall average is about 3.3. The interval between nesting events within a season varies around a mean of about 13 days (Hirth 1997). Mean clutch size varies widely among populations. Average clutch size reported for Florida was 136 eggs in 130 clutches (Witherington and Ehrhart 1989). Only occasionally do females produce clutches in successive years. Usually 2, 3, 4, or more years intervene between breeding seasons (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991a). Age at sexual maturity is believed to be 20 to 50 years (Hirth 1997).

Leatherback Sea Turtle

Leatherbacks nest an average of five to seven times within a nesting season, with an observed maximum of 11 (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1992). The interval between nesting events within a season is about 9 to 10 days. Clutch size averages 80 to 85 yolked eggs, with the addition of usually a few dozen smaller, yolkless eggs, mostly laid toward the end of the clutch (Pritchard 1992). Nesting migration intervals of 2 to 3 years were observed in leatherbacks nesting on the Sandy Point National Wildlife Refuge, St. Croix, U.S. Virgin Islands (McDonald and Dutton 1996). Leatherbacks are believed to reach sexual maturity in 6 to 10 years (Zug and Parham 1996).

Kemp's Ridley Sea Turtle Kemp's Ridley Sea Turtle

Nesting occurs from April into July during which time the turtles appear off the Tamaulipas and Veracruz coasts of Mexico. Precipitated by strong winds, the females swarm to mass nesting emergences, known as *arribadas* or *arribazones*, to nest during daylight hours. Clutch size averages 100 eggs (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1992).

Some females breed annually and nest an average of 1 to 4 times in a season at intervals of 10 to 28 days. Age at sexual maturity is believed to be between 7 to 15 years (Turtle Expert Working Group 1998).

Population dynamics

Loggerhead Sea Turtle

Total estimated nesting in the southeast United States is approximately 50,000 to 90,000 nests per year (Florida Fish and Wildlife Conservation Commission statewide nesting database 2004, Georgia Department of Natural Resources statewide nesting database 2004, South Carolina Department of Natural Resources statewide nesting database 2004, North Carolina Wildlife Resources Commission statewide nesting database 2004). In 1998, 85,988 nests were documented in Florida alone. However, in 2001, 2002, 2003, and 2004, this number dropped to 69,657, 62,905, 56,852, and 47,173, respectively. An analysis of nesting data from the Florida Index Nesting Beach Survey (INBS) Program from 1989 to 2004, a period encompassing index surveys that are more consistent and more accurate than surveys in previous years, has shown no detectable trend but, more recently (1998 through 2004), has shown evidence of a declining trend (Blair Witherington, Florida Fish and Wildlife Conservation Commission (FWC), personal communication, 2005). Given inherent annual fluctuations in nesting and the short time period over which the decline has been noted, caution is warranted in interpreting the decrease in terms of nesting trends.

From a global perspective, the southeastern U.S. nesting aggregation is of paramount importance to the survival of the species and is second in size only to that which nests on islands in the Arabian Sea off Oman (Ross 1982; Ehrhart 1989; National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b). The status of the Oman loggerhead nesting population, reported to be the largest in the world (Ross 1979), is uncertain because of the lack of long-term standardized nesting or foraging ground surveys and its vulnerability to increasing development pressures near major nesting beaches and threats from fisheries interactions on foraging grounds and migration routes (Earl Possardt, U.S. Fish and Wildlife Service, personal communication, 2005). The loggerhead nesting aggregations in Oman, the southeastern U.S., and Australia have been estimated to account for about 88 percent of nesting worldwide (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b). About 80 percent of loggerhead nesting in the southeastern U.S. occurs in six Florida counties (Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward counties) (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b).

Anthropogenic (human) factors that impact hatchlings and adult female turtles on land, or the success of nesting and hatching include: beach erosion, armoring and nourishment; artificial lighting; beach cleaning; increased human presence; recreational beach equipment; beach driving; coastal construction and fishing piers; exotic dune and beach vegetation; and poaching. An increased human presence at some nesting beaches or close to nesting beaches has led to secondary threats such as the introduction of exotic fire ants, feral hogs, dogs, and an increased

presence of native species (*e.g.*, raccoons, armadillos, and opossums), which raid and feed on turtle eggs. Although sea turtle nesting beaches are protected along large expanses of the western North Atlantic coast, other areas along these coasts have limited or no protection.

Loggerhead turtles are affected by a completely different set of anthropogenic threats in the marine environment. These include oil and gas exploration, and transportation; marine pollution; underwater explosions; hopper dredging, offshore artificial lighting; power plant entrainment and/or impingement; entanglement in debris; ingestion of marine debris; marina and dock construction and operation; boat collisions; poaching, and fishery interactions. In the pelagic environment, loggerheads are exposed to a series of longline fisheries that include the U.S. Atlantic tuna and swordfish longline fisheries, an Azorean longline fleet, a Spanish longline fleet, and various fleets in the Mediterranean Sea (Aguilar et al. 1995; Bolten et al. 1994; Crouse 1999). In the benthic environment in waters off the coastal U.S., loggerheads are exposed to a suite of fisheries in federal and state waters including trawl, purse seine, hook and line, gillnet, pound net, longline, dredge, and trap fisheries.

Green Sea Turtle

About 150 to 2,750 females are estimated to nest on beaches in the continental U.S. annually (Florida Fish and Wildlife Conservation Commission 2005). In the U.S. Pacific, over 90 percent of nesting throughout the Hawaiian archipelago occurs at the French Frigate Shoals, where about 200 to 700 females nest each year (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998). Elsewhere in the U.S. Pacific, nesting takes place at scattered locations in the Commonwealth of the Northern Marianas, Guam, and American Samoa. In the western Pacific, the largest green turtle nesting aggregation in the world occurs on Raine Island, Australia, where thousands of females nest nightly in an average nesting season (Limpus et al. 1993). In the Indian Ocean, major nesting beaches occur in Oman where 30,000 females are reported to nest annually (Ross and Barwani 1995).

Leatherback Sea Turtle

Recent estimates of global nesting populations indicate 26,000 to 43,000 nesting females annually (Spotila et al. 1996). The largest nesting populations at present occur in the western Atlantic in French Guiana (4,500 to 7,500 females nesting/year) and Colombia (estimated several thousand nests annually), and in the western Pacific in West Papua (formerly Irian Jaya) and Indonesia (about 600 to 650 females nesting/year). In the United States, small nesting populations occur on the Florida east coast (100 females/year) (Florida Fish and Wildlife Conservation Commission 2005), Sandy Point, U.S. Virgin Islands (50 to 190 females/year) (Alexander et al. 2002) and Puerto Rico (30 to 90 females/year).

Kemp's Ridley Sea Turtle

The 40,000 nesting females estimated from a single mass nesting emergence in 1947 reflected a much larger total number of nesting turtles in that year than exists today (Carr 1963; Hildebrand 1963). However, nesting in Mexico has been steadily increasing in recent years -- from 702

nests in 1985 to over 10,000 nests in 2005 (U.S. Fish and Wildlife Service 2005). Despite protection for the nests, turtles have been and continue to be lost to incidental catch by shrimp trawls (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1992).

Status and distribution

Loggerhead Sea Turtle

Genetic research involving analysis of mitochondrial DNA has identified five different loggerhead subpopulations/nesting aggregations in the western North Atlantic: (1) the Northern Subpopulation occurring from North Carolina to around Cape Canaveral, Florida (about 29° N.); (2) South Florida Subpopulation occurring from about 29° N. on Florida's east coast to Sarasota on Florida's west coast; (3) Dry Tortugas, Florida, Subpopulation, (4) Northwest Florida Subpopulation occurring at Eglin Air Force Base and the beaches near Panama City; and (5) Yucatán Subpopulation occurring on the eastern Yucatán Peninsula, Mexico (Bowen 1994; 1995; Bowen et al. 1993; Encalada et al. 1998; Pearce 2001). These data indicate that gene flow between these five regions is very low. If nesting females are extirpated from one of these regions, regional dispersal will not be sufficient to replenish the depleted nesting subpopulation.

The Northern Subpopulation has declined substantially since the early 1970s. Recent estimates of loggerhead nesting trends from standardized daily beach surveys showed significant declines ranging from 1.5% to 2.0% annually (Mark Dodd, Georgia Department of Natural Resources, personal communication, 2005). Nest totals from aerial surveys conducted by the South Carolina Department of Natural Resources showed a 3.3% annual decline in nesting since 1980. Overall, there is strong statistical evidence to suggest the Northern Subpopulation has sustained a long-term decline.

Data from all beaches where nesting activity have been recorded indicate that the South Florida Subpopulation has shown significant increases over the last 25 years. However, an analysis of nesting data from the Florida INBS Program from 1989 to 2002, a period encompassing index surveys that are more consistent and more accurate than surveys in previous years, has shown no detectable trend and, more recently (1998 through 2002), has shown evidence of a declining trend (Blair Witherington, FWC, personal communication, 2003). Given inherent annual fluctuations in nesting and the short time period over which the decline has been noted, caution is warranted in interpreting the decrease in terms of nesting trends.

A near census of the Dry Tortugas Subpopulation undertaken from 1995 to 2001 reveals a mean of 213 nests per year, which equates to about 50 females nesting per year (Florida Fish and Wildlife Conservation Commission 2005). The trend data for the Dry Tortugas Subpopulation are from beaches that were not part of Florida's INBS program prior to 2004 but have moderately good monitoring consistency. There are 7 continuous years (1995-2001) of data for this Subpopulation, but the time series is too short to detect a trend (Blair Witherington, FWC, personal communication, 2005).

Nesting surveys in the Yucatán Subpopulation have been too irregular to date to allow for a meaningful trend analysis (Turtle Expert Working Group 1998, 2000).

A near census of the Florida Panhandle Subpopulation undertaken from 1989 to 2002 reveals a mean of 1,028 nests per year, which equates to about 251 females nesting per year (Florida Fish and Wildlife Conservation Commission 2005). Evaluation of long-term nesting trends for the Florida Panhandle Subpopulation is difficult because of changed and expanded beach coverage. Although there are now 8 years (1997-2004) of INBS data for the Florida Panhandle Subpopulation, the time series is too short to detect a trend (Blair Witherington, FWC, personal communication, 2005).

Threats include incidental take from channel dredging and commercial trawling, longline, and gill net fisheries; loss or degradation of nesting habitat from coastal development and beach armoring; disorientation of hatchlings by beachfront lighting; excessive nest predation by native and non-native predators; degradation of foraging habitat; marine pollution and debris; watercraft strikes; and disease. There is particular concern about the extensive incidental take of juvenile loggerheads in the eastern Atlantic by longline fishing vessels from several countries.

Loggerheads are the most common nesting sea turtle and account for over 99 percent of the sea turtle nests in northwest Florida. The eastern portion of the region has the majority of loggerhead nesting (**Figure 3**). Nesting densities range from 1.1 to 9.7 nests per mile in the region (**Figure 4**). The loggerhead sea turtle nesting and hatching season for the region is generally considered to extend between May 1 and November 1. The earliest nest documented was on May 1 (Franklin and Okaloosa counties) and the latest nest was on November 1 (Bay County) (Florida Fish and Wildlife Conservation Commission statewide nesting database). Nest incubation ranges from about 49 to 95 days.

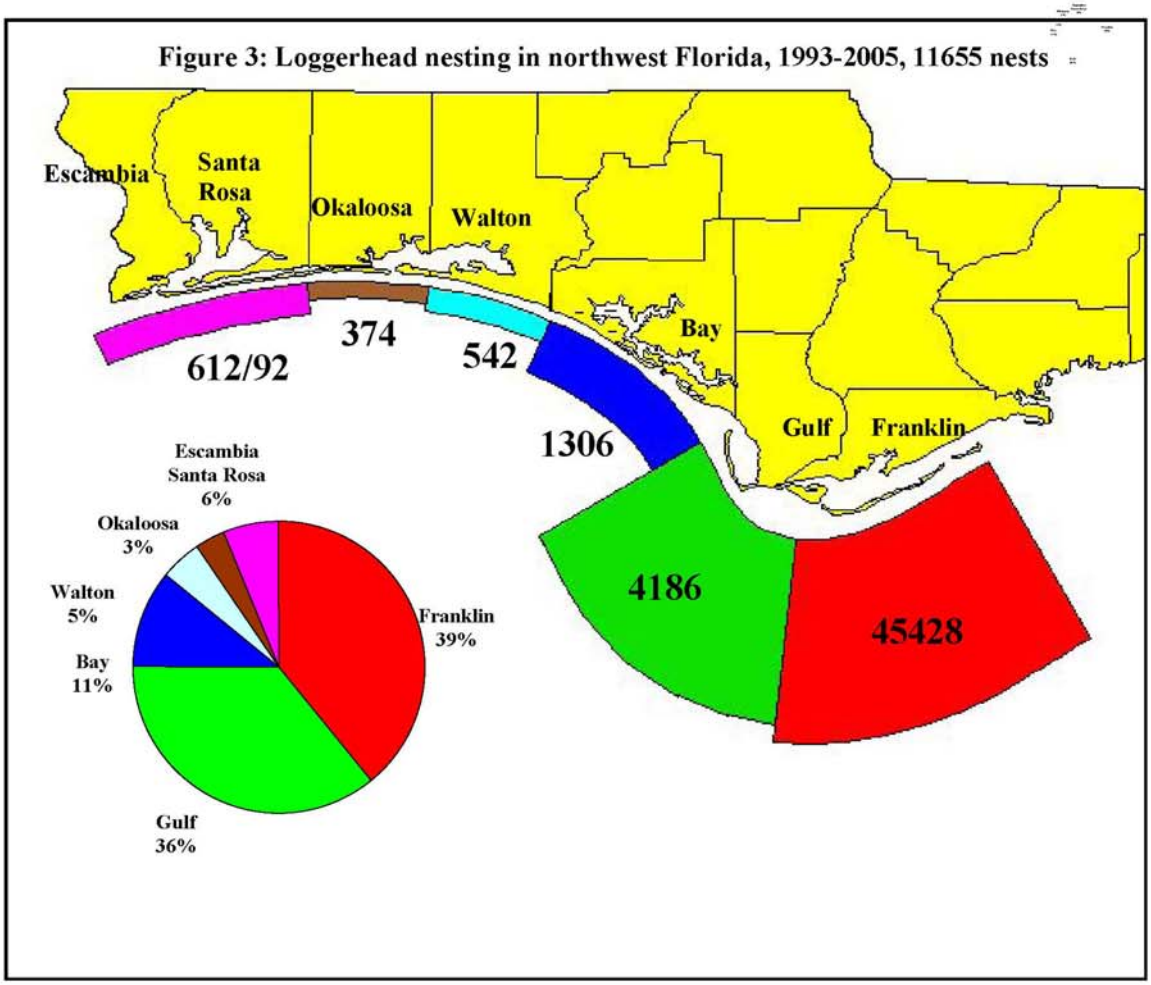

Figure 3: Loggerhead nesting in northwest Florida, 1993-2005, 11655 nests

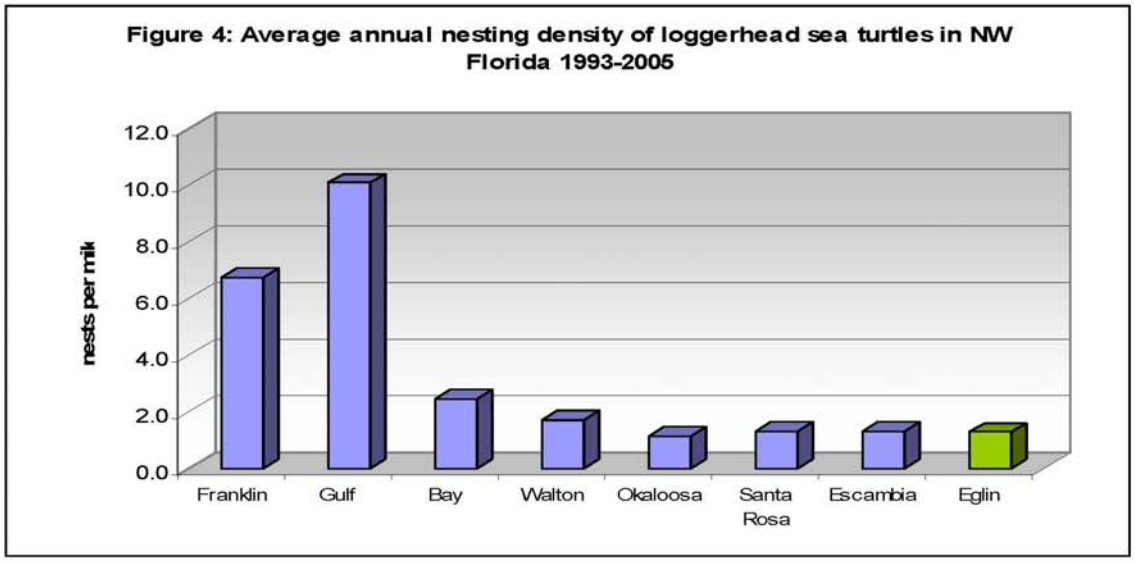

Figure 4: Average annual nesting density of loggerhead sea turtles in NW Florida 1993-2005

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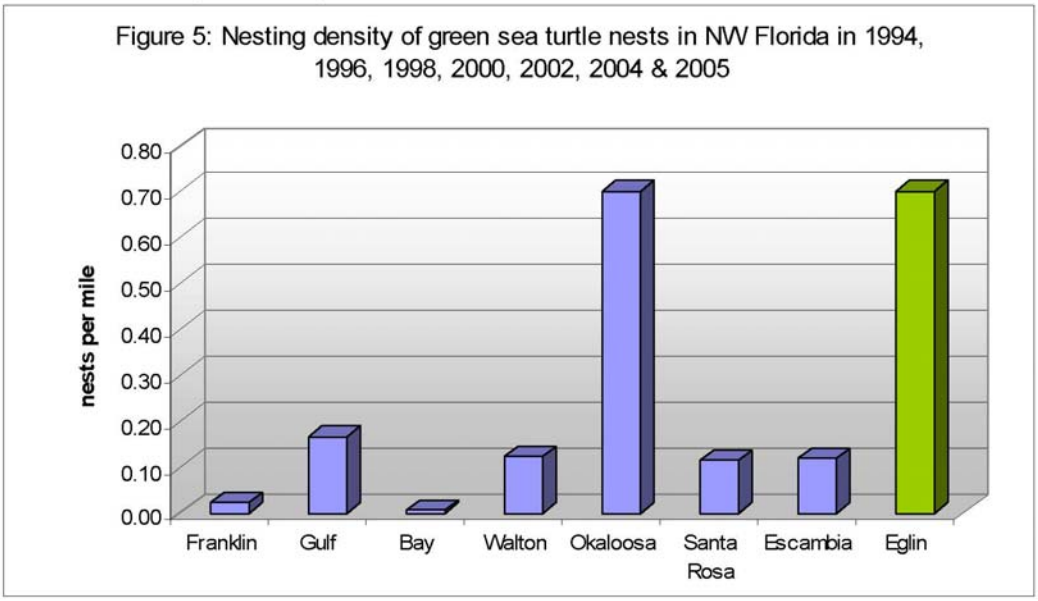
Green Sea Turtle

Total population estimates for the green turtle are unavailable, and trends based on nesting data are difficult to assess because of large annual fluctuations in numbers of nesting females. For instance, in Florida, where the majority of green turtle nesting in the southeastern U.S. occurs, estimates range from 150 to 2,750 females nesting annually (Florida Fish and Wildlife Conservation Commission 2005). Populations in Surinam and Tortuguero, Costa Rica, may be stable, but there is insufficient data for other areas to confirm a trend.

A major factor contributing to the green turtle's decline worldwide is commercial harvest for eggs and food. Fibropapillomatosis, a disease of sea turtles characterized by the development of multiple tumors on the skin and internal organs, is also a mortality factor and has seriously impacted green turtle populations in Florida, Hawaii, and other parts of the world. The tumors interfere with swimming, eating, breathing, vision, and reproduction, and turtles with heavy tumor burdens may die. Other threats include loss or degradation of nesting habitat from coastal development and beach armoring; disorientation of hatchlings by beachfront lighting; excessive nest predation by native and non-native predators; degradation of foraging habitat; marine pollution and debris; watercraft strikes; and incidental take from channel dredging and commercial fishing operations.

Green sea turtle nesting has been documented in all counties (but not on all beaches) in northwest Florida (**Figure 5)**. The green sea turtle nesting and hatching season for this region extends from May 1 through October 31, the earliest nest was documented on May 19 (Franklin County) and the latest nest was documented on August 23 (Escambia County). Nest incubation ranges from about 60 to 90 days. Nesting in northwest Florida has been consistently documented at least every other year since 1990 (Florida Fish and Wildlife Conservation Commission statewide nesting database).

Figure 5: Nesting density of green sea turtle nests in NW Florida in 1994, 1996, 1998, 2000, 2002, 2004 & 2005



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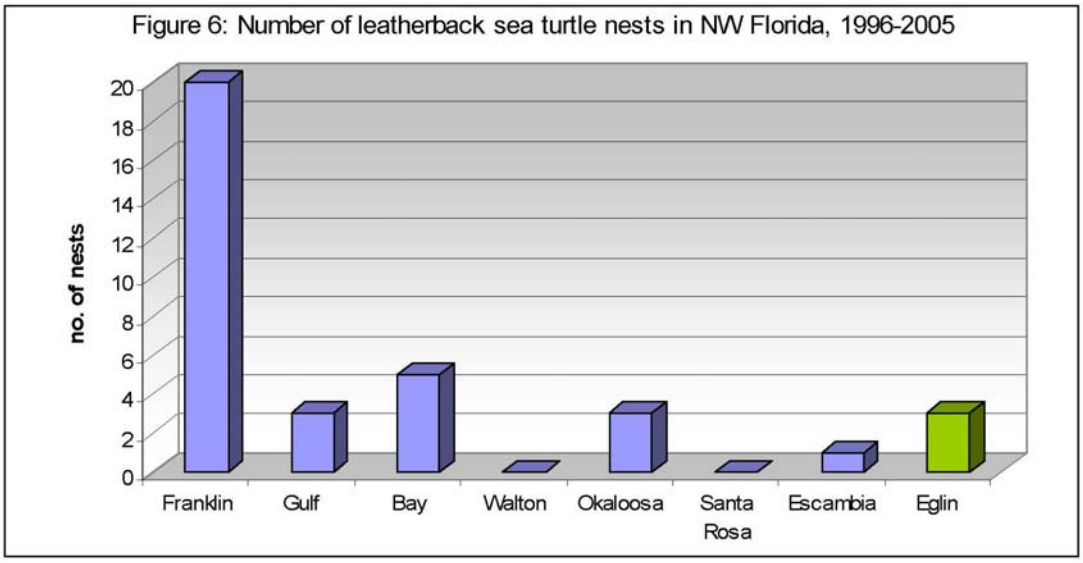
Leatherback Sea Turtle

Declines in leatherback nesting have occurred over the last two decades along the Pacific coasts of Mexico and Costa Rica. The Mexican leatherback nesting population, once considered to be the world's largest leatherback nesting population (65 percent of worldwide population), is now less than one percent of its estimated size in 1980. Spotila et al. (1996) recently estimated the number of leatherback sea turtles nesting on 28 beaches throughout the world from the literature and from communications with investigators studying those beaches. The estimated worldwide population of leatherbacks in 1995 was about 34,500 females on these beaches with a lower limit of about 26,200 and an upper limit of about 42,900. This is less than one third the 1980 estimate of 115,000. Leatherbacks are rare in the Indian Ocean and in very low numbers in the western Pacific Ocean. The largest population is in the western Atlantic. Using an age-based demographic model, Spotila et al. (1996) determined that leatherback populations in the Indian Ocean and western Pacific Ocean cannot withstand even moderate levels of adult mortality and that even the Atlantic populations are being exploited at a rate that cannot be sustained. They concluded that leatherbacks are on the road to extinction and further population declines can be expected unless action is taken to reduce adult mortality and increase survival of eggs and hatchlings.

The crash of the Pacific leatherback population is believed primarily to be the result of exploitation by humans for the eggs and meat, as well as incidental take in numerous commercial fisheries of the Pacific. Other factors threatening leatherbacks globally include loss or degradation of nesting habitat from coastal development; disorientation of hatchlings by beachfront lighting; excessive nest predation by native and non-native predators; degradation of foraging habitat; marine pollution and debris; and watercraft strikes.

Documented leatherback nests are rare in northwest Florida. From 1993 to 2005, a total of 32 nests have been reported on northwest Florida beaches (Fish and Wildlife Conservation Commission statewide nesting database) (**Figure 6**). The first recorded leatherback nest in the region was in 1974, on St. Vincent Island, Franklin County. The majority of the nests have had low natural hatching success. The greatest number of successful nests in any one season occurred in 2000, when three leatherback nests were documented to produce hatchlings that successfully emerged from the nest. One nest was on the Ft. Pickens Unit of Gulf Islands National Seashore, Escambia County and two of the nests were on Eglin Air Force Base, Santa Rosa Island, Okaloosa County. The leatherback sea turtle nesting and hatching season for this region extends from late April through October 31. For confirmed nesting, the earliest nest was documented on April 18 (Franklin County) and the latest nest documented on July 24 (Bay County). Documented nest incubation in northwest Florida ranges from about 63 to 84 days (Fish and Wildlife Conservation Commission statewide nesting database).



Kemp's Ridley Sea Turtle

The decline of this species was primarily due to human activities, including the direct harvest of adults and eggs and incidental capture in commercial fishing operations. Today, under strict protection, the population appears to be in the early stages of recovery. The recent nesting increase can be attributed to full protection of nesting females and their nests in Mexico resulting from a bi-national effort between Mexico and the U.S. to prevent the extinction of the Kemp's ridley, and the requirement to use TED's in shrimp trawls both in the United States and Mexico.

The Mexico government also prohibits harvesting and is working to increase the population through more intensive law enforcement, by fencing nest areas to diminish natural predation, and by relocating all nests into corrals to prevent poaching and predation. While relocation of nests into corrals is currently a necessary management measure, this relocation and concentration of eggs into a "safe" area is of concern since it makes the eggs more susceptible to reduced viability due to movement-induced mortality, disease vectors, catastrophic events like hurricanes, and marine predators once the predators learn where to concentrate their efforts.

Eleven Kemp's ridley nests have now been documented in Florida in Escambia, Lee, Palm Beach, Pinellas, Santa Rosa, Sarasota, and Volusia counties (Fish and Wildlife Conservation Commission statewide nesting database). The Kemp's ridley sea turtle nesting and hatching season for this region extends from May 1 through October 31. For confirmed nesting, the earliest nest in northwest Florida was documented on June 2 (Escambia County) and the latest nest June 25 (Santa Rosa County).

Common threats to all sea turtles in Northwest Florida

Coastal development

Loss of nesting habitat related to coastal development has had the greatest impact on nesting sea turtles in this region. Beachfront development not only causes the loss of suitable nesting habitat but can result in the disruption of powerful coastal processes accelerating erosion and interrupting the natural shoreline migration (National Research Council 1990b). This may in turn cause the need to protect upland structures and infrastructure by armoring, groin placement, beach berm construction, and beach nourishment which cause changes in, additional loss or impact to the remaining sea turtle habitat.

Hurricanes

Hurricanes were probably responsible for maintaining coastal beach habitat upon which sea turtles depend through repeated cycles of destruction, alteration, and recovery of beach and dune habitat. Hurricanes generally produce damaging winds, storm tides and surges, and rain and can result in severe erosion of the beach and dune systems. Overwash and blowouts are common on barrier islands. Hurricanes and other storms can result in the direct or indirect loss of sea turtle nests, either by erosion or washing away of the nests by wave action or inundation or "drowning" of the eggs or hatchlings developing within the nest or indirectly by loss of nesting habitat. Depending on their frequency, storms can affect sea turtles on either a short-term basis (nests lost for one season and/or temporary loss of nesting habitat) or long term, if frequent (habitat unable to recover). How hurricanes affect sea turtle nesting also depends on its characteristics (winds, storm surge, rainfall), the time of year (within or outside of the nesting season), and where the northeast edge of the hurricane crosses land.

Because of the limited remaining nesting habitat, frequent or successive severe weather events could threaten the ability of certain sea turtle populations to survive and recover. Sea turtles evolved under natural coastal environmental events such as hurricanes. The extensive amount of pre-development coastal beach and dune habitat allowed sea turtles to survive even the most severe hurricane events. It is only within the last 20 to 30 years that the combination of habitat loss to beachfront development and destruction of remaining habitat by hurricanes has increased the threat to sea turtle survival and recovery. On developed beaches, typically little space remains for sandy beaches to become re-established after periodic storms. While the beach itself moves landward during such storms, reconstruction or persistence of structures at their pre-storm locations can result in a major loss of nesting habitat.

Beachfront Lighting

Beachfront lighting may cause disorientation (loss of bearings) and misorientation (incorrect orientation) of sea turtle hatchlings. Visual signs are the primary sea-finding mechanism for hatchlings (Mrosovsky and Carr 1967; Mrosovsky and Shettleworth 1968; Dickerson and Nelson 1989; Witherington and Bjorndal 1991). Artificial beachfront lighting is a documented cause of

hatchling disorientation and misorientation on nesting beaches (Philibosian 1976; Mann 1977; Conti 2005). The emergence from the nest and crawl to the sea is one of the most critical periods of a sea turtle's life. Hatchlings that do not make it to the sea quickly become food for ghost crabs, birds, and other predators or become dehydrated and may never reach the sea. Some types of beachfront lighting attract hatchlings away from the sea while some lights cause adult turtles to avoid stretches of brightly illuminated beach. Research has documented significant reduction in sea turtle nesting activity on beaches illuminated with artificial lights; relative to adjacent areas (Witherington 1992). During the 2003 sea turtle nesting season in Florida, over 79,000 turtle hatchlings were disoriented. In 2002, lighting associated with condominiums had the greatest impact causing disorientation/misorientation of 35 percent. Other causes included street lights, parking lot lights, single family residences, and sky glow (Conti 2005).

In 2001, the Eglin Natural Resources received funding to convert/replace the remaining lights on SRI Air Force property to low pressure sodium lighting. Low pressure sodium lighting minimizes the risk of disorientation of sea turtles. Eglin has installed low pressure sodium vapor lighting at all test sites along SRI. Eglin continues to ensure that all Eglin-associated lighting visible from the beach is minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the water surface and nesting beach.

Eglin NRS documented sixteen accounts of disorientation from September 2001 through August 2005. The direction of disorientation is primarily to the north with the lighting source documented as the following:

- Gas station on Navarre Beach
- AF test site lighting
- Sky glow
- Parking lot lights
- General urban light pollution
- Radar test site lighting
- Navarre beach condo lights

The numbers of disoriented turtles ranged from 1 to 90 with an average of 29.4 turtles being disorientated per event. Very few turtles have been documented as dead due to disorientation; however, for each disorientation event, 1.1 turtles were found dead.

Predation

Depredation by a variety of predators can considerably decrease sea turtle nest hatching success. Depredation and harassment or both of nesting turtles, eggs, nests and hatchlings by native and non-native species, such as raccoon, coyote, fox, feral hog, cats, birds, and ghost crab, have been documented on the Atlantic and Gulf coasts of Florida (Daniel et al. 2002; Northwest Florida Partnership 2000; Leland 1997; Maxwell 2002; National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991a). As nesting habitat dwindles, it is essential that nest production be naturally maximized so the turtles may continue to exist in the wild.

Predators of sea turtle nests and hatchlings on Eglin, SRI have included raccoon, coyote, red fox, ghost crabs, and fire ants. Documented depredation rates on Eglin increased from 10 percent of the loggerhead nests in 1993 to 67 percent of the loggerhead nests in 1997. An intensive integrated predator control approach was implemented on the island during the 1998 nesting season (Miller 2005a; Eglin 2005a; Eglin 2005b). Reduction in predation rates improved slightly in 1998 (54 percent) and by 2001, the rate was reduced to zero percent.

Eglin's program has been part of the State/Federal interagency partnership for protection of threatened and endangered species on coastal public lands in northwest Florida through predator control. The partners have contracted with the U.S. Department of Agriculture to implement the predator control plan since 1997. It has been successful throughout the region. Continued low predation rates of sea turtle nests throughout northwest Florida have been documented. The integrated predator approach begins with protection of the sea turtle nests as soon as they are laid. As nests are located the morning after they are deposited, a hatchling self-releasing flat screen is placed on top of each nest. As needed, direct control of problem predators is also accomplished.

Driving on the Beach

The operation of motor vehicles on the beach affects sea turtles by interrupting a female turtle approaching the beach to nest; disorienting or misorienting emergent hatchlings from headlights; vehicles running over hatchlings attempting to reach the ocean; and vehicle tracks interfering with hatchlings crawling to the ocean. Apparently, hatchlings become diverted not because they cannot physically climb out of the vehicle tracks (Hughes and Caine 1994), but because the sides of the track cast a shadow and the hatchlings lose their line of sight to the ocean horizon (Mann 1977). The extended period of travel required to negotiate tire tracks may increase the susceptibility of hatchlings to dehydration and depredation during migration to the ocean (Hosier et al. 1981). Driving directly above or over incubating egg clutches or on the beach can cause sand compaction which may result in adverse impacts on nest site selection, digging behavior, clutch viability, and hatchling emergence, nest success reduction and directly killing pre-emergent hatchlings (Mann 1977; Nelson and Dickerson 1987; Nelson 1988).

The physical changes and loss of plant cover caused by vehicles on dunes can lead to various degrees of instability, and therefore encourage dune migration. As vehicles move either up or down a slope, sand is displaced downward, lowering the trail. Plant growth is inhibited and open the area to wind erosion, causing the dunes to become unstable and migrate. Unvegetated sand dunes may continue to migrate across stable areas as long as vehicle traffic continues. Vehicular traffic through dune breaches, or low dunes on an eroding beach may cause accelerated rate of overwash and beach erosion (Godfrey et al. 1978). If driving is required, the area where the least amount of impact occurs is the beach between the low and high tide water lines. Vegetation on the dunes can quickly reestablish provided the mechanical impact is removed.

Driving on the beach at Eglin is only allowed for military missions and to implement Eglin's Integrated Natural Resources Management Program (INRMP 2002) including the protection,

conservation, management and research of natural resources. In completing formal consultations with Eglin on the INRMP in 1999, the Service has included protocol for driving on the beach during sea turtle nesting season.

Erosion

Erosion problems on SRI have been particularly substantial on the Gulf of Mexico shoreline. Approximately 2.0 miles of U.S. Hwy 98 have washed out as a result of Hurricane Opal (1995), Hurricane Ivan (2004), and Hurricane Dennis (2005). Following Hurricane Opal, Eglin instituted a large scale dune building program and was successful in the creation of a strong dune system that lasted until Hurricane Ivan. Hurricane Dennis eroded the few remaining dunes on SRI after Ivan. Eglin is currently evaluating options to rebuild the dune system on SRI. In addition, erosion of SRI has been accelerated by the construction of inlet jetties for the East Pass in 1967-1969. The beach for approximately 20,000 feet west of East Pass is highly erosive. Erosion rates range from -1.0 to -8.5 feet/year.

Sea Turtles Nesting

Eglin implements guidelines/regulations to address conservation and management of sea turtles on Santa Rosa Island (INRMP, 2002; Eglin, 2005a; Eglin, 2005b). Eglin initiated conservation and management of sea turtles on base controlled lands in 1987. The monitoring is conducted under State of Florida permit no. 076/161 (Fish and Wildlife Conservation Commission statewide nesting database). Nesting surveys are conducted seven days a week from May 1 to September 1. Nest hatching surveys may continue into mid-November depending on nest incubation. Eglin participates in the State's INBS program. The beachfront is divided into one-half mile segments for reporting purposes. Surveys begin at sunrise. Approximately 17 miles of Santa Rosa Island are surveyed by using all terrain vehicles (ATVs). Turtle crawls are identified as a true nesting crawl or false crawl. Nests are marked with stakes and surrounded with surveyor flagging tape, and if needed screened to prevent predation. The marked nests are monitored throughout the incubation period for storm damage, predation, hatching activity and hatch and emergence success. Nests are relocated if threatened by erosion or inundation or required as part of consultation with the Service. Nests are relocated within the first 12 hours of being deposited, or before 9 a.m. the morning following deposition.

Analysis of the species/critical habitat likely to be affected

Santa Rosa Island is a barrier island and part of a complex and dynamic coastal system that is continually responding to inlets, tides, waves, erosion and deposition, longshore sediment transport, and depletion, fluctuations in sea level, and weather events. The location and shape of barrier islands beaches perpetually adjusts to these physical forces. Winds move sediment across the dry beach forming dunes and the island interior landscape. The natural communities contain plants and animals that are subject to shoreline erosion and deposition, salt spray, wind, drought conditions, and sandy soils. Vegetative communities include foredunes, primary and secondary dunes, interdunal swales, sand pine scrub, and maritime forests. During storm events, overwash is common and may breach the island at dune gaps or other weak spots, depositing sediments on

the interior and backsides of islands, increasing island elevation and accreting the sound shoreline. Breaches may result in new inlets through the island.

The storm protection consultation is to address the facility protection work at Test Sites A-3, A-3½, A-6, A-11, A-13, A-13B, and A-18 on SRI. These activities are to take place as soon as possible and within the 2006 and 2007 sea turtle nesting seasons (May 1 through October 31). No night activities are anticipated. Thus, the work is to install physical storm protection structures on the beach where sea turtles nest during the sea turtle nesting season from May 1 though October 31. The structures may also possibly affect the integrity of the island. Based on previous consultations, Eglin has incorporated conservation measures into the project to address potential impacts of the storm protection structures and installation activities on sea turtles. The effect of the activities covered under the consultation with incorporation of the proposed conservation measures on each sea turtle species' overall survival and recovery are considered in this biological opinion.

Effects covered under the storm protection consultation include the physical presence and installation of armoring structures, the nightly storage of equipment and materials on the beach and work on the beach during daylight hours during the sea turtle nesting season. These effects may result in causing female turtles to false crawl or abort the nesting process as they approach the beach and select a suitable site to nest or be injured or entrapped and hatchling turtles to be injured or entrapped as they emerge from the nest and crawl to the Gulf of Mexico. Erosion of the beach from the physical presence of the armoring structures could affect the quality of nesting habitat.

Other activities that have affected the conservation of sea turtle nesting in northwest Florida are included in the Service's evaluation of the species current status (**Table 2**).

Table 2: Previous consultations/biological opinions completed for nesting sea turtles.

SPECIES Loggerhead, green, leatherback, and ridley sea turtles	YEAR	MONITORING REPORTS		PROJECT ACTIVE YES/NO
		Received	Not Received	
Panama City Beach beach nourishment original Amendments 1-6	1998 2001-2005	Yes Annual reports provided by permittee		completed ongoing
Destin Dome OCS offshore oil and gas drilling	2000	None required		yes
Tyndall AFB Driving on the beach	2000	Yes Annual reports provided Tyndall NRB		ongoing
East Pass Re-opening	2001	Yes final report provided Tyndall NRB		completed
Eglin AFB porous groin within season	2001	Yes Annual reports provided Eglin NRB		completed

Eglin AFB INRMP	2002	Yes various reports provided Eglin NRB		ongoing
Eglin 737 Sensor Test Site 13-A SRI	2002	Yes Annual reports provided Eglin NRB		ongoing
Pensacola Beach beach nourishment original Amendment 1	2002 2005	Yes Annual reports provided by permittee		ongoing
Eglin Marine Expeditionary Unit Training	2003	Yes Annual reports provided Eglin NRB		ongoing
Eglin AFB U.S. Army Ranger Los Banos	2003	Yes Annual reports provided Eglin NRB		ongoing
Alligator Point beach nourishment	2004	Yes Annual reports provided by permittee		Not started
Eglin AFB Airborne Littoral Reconnaissance Test	2004	Yes Annual reports provided Eglin NRB		ongoing
Walton County-Destin beach nourishment	2004	Final report provided by permittee		Not started
Eglin AFB Advance Skills Training	2004	Yes Annual reports provided Eglin NRB		ongoing
Navarre beach nourishment emergency consultation	2005	Final report provided by permittee		Not started
FEMA beach berms post Hurricane Ivan emergency consultation	2005	Final project reports required from FEMA grantees		ongoing
Eglin AFB SRI Programmatic Mission Activities	2005	Yes Annual reports provided Eglin NRB		ongoing

ENVIRONMENTAL BASELINE

Status of the Species within the Action Area

Loggerhead sea turtle average annual nesting density on Eglin SRI is about 1.3 nests per mile based on nesting data taken between 1989 and 2005. During that time, 364 loggerhead nests and 272 false crawls were documented. Peak nesting activity occurs in June and July. Average incubation of nests is 68 days (range 52 to 89 days) with hatching peaking in August. The average annual nest emergence success rate was 55 percent. Few nests are relocated for conservation or mission purposes. Three relocated nests (2001 – 2003) had a mean hatching success rate of 44 percent. While there is no clear delineation of nesting density along the 17 miles of Gulf beachfront on SRI, there are areas where nesting is higher. Higher densities are noted along portions of SRI near Test Sites A-2, A-4, between A-9 and A-13, and between A-15A and A-15.

Eglin SRI supports the highest number of green sea turtle nests in northwest Florida. Green sea turtle average annual nesting density is about 0.7 nest per mile based on nesting data taken between 1990 and 2005. Green turtle nesting has been documented on SRI every other year since 1990. However, beginning in 1997 a potential change in the nesting trend was observed. There were a total of 111 green turtle nests during the 1994, 1996, 1997, 1998, 2000, 2002, 2003, and 2005 seasons. Peak nesting occurs in June and July. Average incubation of nests is 68 days (range 51 to 82 days) with hatching peaking in September. The average annual nest emergence success rate has been 53 percent. The majority of the nests have been located between Test Sites A-7 and A-13B.

Leatherback nesting was documented on Eglin SRI for the first and only time in 2000. Three nests were deposited that year. The nests were laid in June and hatched in September. The average nest emergence success rate was 69 percent. The nests were located between sites A-7 and A-10.

A Kemp's ridley sea turtle may have nested on Eglin SRI in 2004; eggs have been sent off for DNA testing (Miller 2006). Kemp's ridley nests have been confirmed on adjacent and other beaches to the west (Navarre and Perdido Key), thus, there is a higher likelihood of Kemp's ridley nesting to occur on Eglin.

Factors affecting species environment within the action area

Eglin participates in the State of Florida Sea Turtle Stranding and Salvage Network (STSSN) and completes and submits STSSN reports as appropriate. From 1989 through October 2005, 73 sea turtles were documented to strand on Eglin beaches or Gulf front lands. Average annual strandings are approximately 5 per year (range 1 to 10). The species that were stranded included: loggerhead (43), leatherback (11), ridley (7), green (7), and unidentified (5). Strandings found on the public beaches of Eglin were nearest Site A-1 (nine) and Site A-3 (five). The majority of the strandings were located on the restricted-access portions of the island near Site A-10. Ten strandings were on the shoreline of Choctawhatchee Bay within the boundaries of Eglin (Miller 2005b). The overall number of strandings reported for Eglin continues to be above average from previous years (http://research.myfwc.com).

Beachfront lighting management has been implemented for military controlled facilities on SRI. By far, the sky glow from Ft. Walton Beach north of Santa Rosa Sound causes the greatest number of disorientations. Other noted causes include lighting from beachfront development (condominiums, restaurants, and hotels), base housing across the Sound on Hurlburt Field, and lights at Test Sites A-4, A-10, and A-11 (FWC/Florida Fish and Wildlife Research Institute Marine Turtle Hatchling Disorientation Incident Report Forms, 1993 to 2004).

EFFECTS OF THE ACTION

Factors to be considered

The SRI storm protection action is to protect mission-essential critical military facilities with armoring. Because of the upcoming hurricane season which begins on June 1, 2006, it is essential that the storm protection is in place. The majority of hurricanes tend to occur during the late part of the season in September and October. Thus, the work will begin as soon as feasible and continue into the 2006 and possibly the 2007 sea turtle nesting and hatching seasons (May 1 through October 31). Sea turtles are nocturnal nesters and emergence of hatchlings from the nest is usually during the night. The storm protection work will be conducted during daylight hours only. However, some construction materials or debris may be left on the nesting beach at night. Direct impacts to nesting or hatchling sea turtles will result from the repair or new installation of the armoring structures that eliminate sea turtle nesting habitat and prevent access to other nesting habitat on the beach. Indirect impacts could include changes in the nesting behavior of adult female sea turtles, change in the behavior of hatchling sea turtles as they emerge from the nest and crawl to the water, missed nests and hatching events during routine nesting surveys, and temporary or long term alterations to the island's beach and dune topography because of the physical presence of the armoring structures.

Protective, avoidance, and minimization measures have been incorporated into the storm protection action to avoid or minimize the potential impacts from the construction work. However, even with the these measures, impacts to nesting and hatchling sea turtles are expected to occur from the installation activities and the physical presence of the armoring. The activities are expected to directly or indirectly adversely affect nesting and hatchling sea turtles and/or their habitat. The activities are located at various sites on the restricted and public portions of SRI. The proposed activity is currently proposed as a one-time activity.

Proximity of Action: The activities would occur directly in and adjacent to nesting habitat for sea turtles. Specifically, the physical presence of the armoring structures will have a long term affect on sea turtles and their nesting habitat on SRI.

Distribution: The storm protection structures that may impact nesting and hatchling sea turtles would occur along 5,710 feet of Gulf of Mexico beachfront. This includes 2,075 feet of new armoring structures. Specific areas covered under this consultation include Test Sites A-3, A-3 ½, A-6, A-11, A-13, A-13B, and A-18.

Timing: The timing of the activities would directly impact nesting and hatchling sea turtles because installation of the armoring is to occur during sea turtle nesting season May 1 and October 31.

Nature of the Effect: The effects of the activities include elimination of sea turtle nesting habitat and the potential change or altered behavior of adult nesting and hatchling sea turtles, decrease in

the nesting and nest hatch success, entrapment of adult or hatchling sea turtles and nests or hatching events being missed during the daily survey.

Duration: The installation activities are expected to be a one-time occurrence and should be completed during 2006 may need to be continued into the 2007. However, the armoring to be installed for storm protection is expected to be permanent until reconstruction of the military facilities can be undertaken.

Disturbance Frequency: The disturbance to nesting sea turtles on SRI from this action will be short term from the installation activities and long term for the armoring structures.

Disturbance Intensity and Severity: The installation activities are expected to have a short term and temporary affect on nesting and hatchling sea turtles. However, the installation of the storm protection armoring could have direct impacts to sea turtle nesting and affect shoreline dynamics in the future.

Analyses for effects of the action

Direct and indirect effects

The BA provided a potential impact analysis of the storm protection structures and installation activities. The impact area was expanded from the 3,710 feet to 5,710 feet to include additional habitat adjacent to the sea walls where nests could be laid and affected by the armoring structures. The armoring may affect 1.51 loggerhead nests and 0.95 nest green sea turtle nest annually during the nesting season. Because of the rarity of nesting activity and paucity of data on leatherback and Kemp's ridley nesting in northwest Florida, it is anticipated that impact to these species would be discountable (too small to count).

Coastal armoring in Florida is allowed to protect public and private infrastructure upland structures because of extreme or critical erosion of the coastal shoreline. This erosion can be a result of normal erosive forces, upstream perturbations (inlets, navigation channels, groins, etc.), disasters or weather events. Regardless of the reason for the eroded beach, impacts to nesting sea turtles are similar. The beach elevation is lowered, possibly resulting in turtles false crawling or depositing eggs in areas subject to continual flooding and/or inundation by tides and wash out by wave action. Nests deposited at the eroded dune or bluff face may also be subject to burial by cave-ins or overtopping of the landward escarpment. However, the greatest difference being whether the erosion is continual, temporary, or permanent. In areas where erosion is continual or permanent, some artificial action to offset the erosion is usually needed where infrastructure or structures are at risk. However, activities that stop or minimize the erosion result in a better long term solution for the coastal environment than coastal armoring. Such activities could include modifying navigation channel operation and maintenance, inlet sand bypassing, and beach and dune restoration. Where erosion is temporary and the coastline is expected to recover, it is prudent to use temporary solutions that would not cause additional harm or exacerbate the existing situation on the coastline. This would allow recovery of the coastline and planning of appropriate actions to address the situation. While SRI is already starting to recover from the

effects of the 2004 and 2005 hurricanes seasons, the military facilities remain in danger from the eroded beach and are not be expected to withstand another active storm season. Effects of armoring include the following.

Research has shown that armoring changes essential behaviors (nesting) of female sea turtles in accessing, locating and selecting a suitable nest site, depositing nests in sub-optimal habitats, and decreasing nesting activity. Thus, these are documented foreseeable impacts to nesting sea turtles where armoring structures have been or will be installed on the beachfront. For example, the placement of armoring structures effectively prevent the access of sea turtles to nesting habitats located landward of the structures by acting as a physical obstacle and reducing available nesting habitat (Mosier 1998). Subsequently female turtles may false crawl as they approach the armoring structure causing them to nest in less than optimal habitats, increasing the physiological stress of nesting through extended time required for nesting, entrapping the nesting turtle causing physical harm, or interfering with the nesting process resulting in the female returning to the sea without nesting (Murphy 1985; Mosier 1998;).

Due to the extreme erosion events that are necessary to require construction of armoring, it is likely that most structures will be placed within the tidal zone of the sea. In addition to the fact that an armoring structure creates a physical obstacle to nesting sea turtles, the interaction between an armoring structure and the hydrodynamics of tide and current often results in the alteration of the beach profile seaward and in the immediate vicinity of the structure (Pilkey and Wright 1988; Terchunian 1988; Tait and Griggs 1990; Plant and Griggs 1992) including increased erosion seaward of structures, increased longshore currents that move sand away from the area, loss of interaction between the dune and ocean, and concentration of wave energy at the ends of an armoring structure (Schroeder and Mosier 1996). These changes or combination of changes can have various detrimental effects to sea turtle nesting and their nesting habitat.

Over the long term, the physical presence of an armored shoreline will result in the annual displacement of sea turtle nests. Studies (Mosier 1998; Mosier and Witherington 2000) indicate that 69 percent fewer female sea turtles emerged to nest on armored beaches compared to adjacent unarmored beaches. Of turtles that did emerge where armoring was present, proportionately fewer nested. Additionally, turtles on armored sections of beach tended to wander greater distances than those that emerged on adjacent unarmored beaches. Armoring can eliminate a sea turtle's access to upper regions of the beach/dune system. Consequently, nests on armored beaches would generally be found at lower elevations than those on unarmored beaches. Nests laid at lower elevations seaward of armoring structures are subject to a greater risk of mortality due to tidal inundation or exacerbated erosion (Schroeder and Mosier 1996). In addition, nests laid at lower elevations are subject to increased moisture from tidal overwash, which can potentially alter thermal regimes, an important factor in determining the sex ratio of hatchlings (Mrosovsky and Provancha 1989; Ackerman1997; Delpech and Foote 1998). Nests laid seaward of armoring structures are also vulnerable to washout. Thus, existing habitat behind armoring structures is lost to nesting turtles and the beaches in front of existing armoring structures represent suboptimal nesting habitat and incubation environments.

Construction of armoring structures is expected to directly affect the nesting shoreline. Construction conducted during the nesting and hatching season could result in the loss of sea turtles through disruption of adult nesting activity and by burial or crushing of nests or hatchlings. A daily nest monitoring and egg relocation program may be implemented to reduce these impacts. However, some nests may be inadvertently missed and left unprotected (Schroeder 1994) or if relocated, result in lower production of hatchling turtles. The study of hatching and emergence success of *in situ* and relocated sea turtle nests in Florida found that hatching success was lower for relocated nests and emergence success was lower for relocated nests by an average of 11.67 percent (Moody 1998).

The placement of hardened structures within areas of tidal influence results in changes to natural beach processes. These changes can result in accelerated erosion seaward of the hardened structure and adjacent to the structure, especially on the downdrift side (end scour) (Pilkey and Wright 1988; Tait and Griggs 1990). Thus, lands adjacent to seawalls could experience an increase in erosion. While these lands may not have previously needed hardened structures, the increased erosion of the land due to the adjacent armoring structures may require installing armoring.

In coordination with the Florida Department of Environmental Protection Beaches and Coastal Systems (FDEP) engineering staff the Service discussed FDEP's assessment of the proposed work relative to the effects on the shoreline dynamics of SRI. Changes in the shoreline dynamics as a result of the armoring could affect sea turtle nests and nesting habitat. Effects include erosion of the sea turtle nesting beach at and in the vicinity of the armoring including increased effects during a storm event if the armoring is not properly installed or located. Specific comments from FDEP regarding armoring siting relative to the active beach and mean high water line are provided below.

Repair and extend damaged seawall at Test Site A-3.
The proposed new wall and rock structures would encroach on the active beach and interfere with the alongshore littoral transport of beach sediments during normal wave conditions and cause erosion of adjacent beach and dunes in the immediate vicinity of the structure. During storm events the structures will increase cross-shore erosion and the formation of escarpments on adjacent unarmored shoreline. There appears to be adequate space available to relocate the seawall landward of the mean high water to minimize impacts to the beach-dune system. *Locating the seawall landward would also minimize impacts to the sea turtle nesting beach.*

Construct new concrete pad and bulkhead at Test Site A-3½.
There appears to be sufficient space landward to locate the concrete pad and concrete bulkhead landward of the mean high water line. *The Service's information indicates that the concrete pad is to be located on top of the existing elevated portion of the Test Site 3 that has been artificially enhanced with clay or other non-beach quality materials. Unless this elevated area could be moved landward it will be subject to additional exposure and erosion. Thus, constructing the concrete pad on the existing elevated mound would not cause additional impacts to the sea turtle nesting beach provided any additional material to accommodate the size of the concrete pad is*

placed in a landward location. In addition, the concrete bulkhead to protect the pad should be located as close as possible to the pad on the seaward side.

Construct new seawall at Test Site A-6.
This site appears to be located over 500 feet landward of the mean high water, and the new seawall would have no effect on adjacent lands except during the most severe storm events when the surge overtops the island. *Current data on sea turtle nesting at Eglin SRI indicates that nests have not been documented further inland than 200 feet of the mean high water line. It would not appear that the proposed sea wall location would affect sea turtle nesting on SRI.*

Repair and extend damaged seawall at Test Site A-11.
The proposed new wall would encroach on the active beach and interfere with the alongshore littoral transport of beach sediments during normal wave conditions and cause erosion of adjacent beach and dunes in the immediate vicinity of the structure. During storm events the structures will increase cross-shore erosion and the formation of escarpments on the adjacent unarmored shoreline. There appears to be adequate space available to relocate the seawall landward of the mean high water to minimize impacts to the beach-dune system. *Locating the seawall landward would minimize impacts to the sea turtle nesting beach.*

Repair and extend damaged seawall at Test Site A-13.
The proposed new wall and rock structures and placement of rock toe scour protection seaward of the existing wall would encroach on the active beach and interfere with the alongshore littoral transport of beach sediments during normal wave conditions and cause erosion of adjacent beach and dunes in the immediate vicinity of the structure. During storm events the structures will increase cross-shore erosion and the formation of escarpments on the adjacent unarmored shoreline. There appears to be adequate space available to relocate the seawall landward of the mean high water to minimize impacts to the beach-dune system. The existing sea wall should be demolished and the new wall constructed as far landward as practicable to minimize impacts to the beach-dune system. *Locating the seawall landward would minimize impacts to the sea turtle nesting beach.*

Construct new seawall at Test Site A-13B.
FDEP did not have adequate site information but recommended that the location of the new seawall be located as far landward as practicable to avoid and minimize adverse impacts to the beach and dune system. *The Service's review of information in the BA indicates that the seawall could be located landward to minimize impacts to the sea turtle nesting beach.*

Construct new seawall at Test Site A-18.
These sites appear to be located over 500 feet landward of the mean high water, and would have no effect on adjacent lands except during the most severe storm events when the surge overtops the island. *Current data on sea turtle nesting at Eglin SRI indicates that nests have not been documented further inland than 200 feet of the mean high water line. It would not appear that the proposed sea wall location would affect sea turtle nesting on SRI.*

In addition to nesting sea turtles being disrupted by the physical presence of armoring structures or project materials, is the injury of a sea turtle by entrapment in project material and demolition debris left on the beach overnight. When encountering a large solid object, a turtle may continue to follow the edge of the structure or turn away seeking a suitable nest site or abort the search and return to the sea (false crawl). If a suitable nest site is not found, excessive crawling quickly depletes a turtle's energy needed for constructing a nest, laying eggs, camouflaging, and returning to the sea. After nesting, a turtle that encounters a large object may be delayed in returning to the sea, become tired and more vulnerable to predators upon returning to the sea. If an object is raised off the ground, it could entrap an adult turtle if adequate clearance is not available for the turtle to pass under or through. The turtle may also perceive the structure as a change in beach topography or confuse the adult's sea-finding behavior by creating a shadow or blocking the brightness over the water. This may not result in just a simple delay in returning to the sea – but death (Witherington and Martin 2003).

One of the most critical acts of a sea turtle takes place immediately after it emerges from the nest. Under natural conditions, hatchlings that have just emerged from the sand crawl in a frenzy directly from nest to the sea. They usually do it as a mass. The zeal is justified given the consequences of delay-death. Hatchlings that are physically kept from reaching the sea or that have their sea-finding disrupted by unnatural stimuli often die from exhaustion, dehydration, predation, and other causes. Entrapment under the work materials and demolition debris could be fatal to hatchling turtles.

It may not feasible to remove the work materials used in the armoring construction or demolition debris every night from the beach. However, minimizing areas of potential entrapment such as under the vehicles by installing a temporary barrier around the material or debris could reduce the potential of impacts to both adult nesting and hatchling sea turtles.

Species response to the proposed action

This biological opinion is based on effects that are anticipated to sea turtles (nesting females, nests, and hatchlings) as a result of: 1) the permanent loss of habitat from the physical presence of armoring structures on a beach that supports nesting sea turtles, 2) the entrapment or injury to adult or hatchling sea turtles from the temporary storage of materials or demolition debris on a sea turtle nesting beach, and 3) the disruption or behavior change of sea finding behavior of nesting or hatchling sea turtles from the permanent physical presence of armoring structures or temporary storage of materials on a sea turtle nesting beach.

Approximately 1.1 miles (26 acres) of sea turtle nesting habitat along the Gulf of Mexico beachfront will be affected in the Action Area. In the context of sea turtle nesting, it is anticipated that approximately 1.51 loggerhead nests, 1 adult loggerhead female turtle, and 172 loggerhead sea turtle hatchlings and 0.95 green nest, 1 adult female green turtle, and 129 green sea turtle hatchlings could be impacted by the armoring on an annual basis within the Action Area. No leatherback or Kemp's ridley sea turtle nests are expected to be impacted. This number is estimated based on the density of sea turtle nesting on Eglin SRI, the nesting that has

been documented in the existing seawall locations, and the implementation of conservation measures proposed by Eglin.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the Action Area considered in this biological opinion. Future Federal actions that are unrelated to the proposed project are not considered in this opinion because they require separate consultation pursuant to section 7 of the Endangered Species Act. Existing land uses to the east (City of Destin) and west (Navarre Beach) of Santa Rosa Island are primarily related to coastal development for human recreation and habitation. The northern boundary consists of high density single family residences on the north shore of Santa Rosa Sound and Hurlburt Field. The Gulf of Mexico makes up the southern boundary of SRI. We are not aware of any future actions that are reasonably certain to occur within the Action Area.

CONCLUSION

After reviewing the current status of the loggerhead, green, leatherback, and Kemp's ridley sea turtles, the environmental baseline for the storm protection work on Santa Rosa Island, Eglin, the effects on the activities, proposed protective, avoidance, and minimization measures, and the cumulative effects, it is the Service's biological opinion that the project, as proposed, is not likely to jeopardize the continued existence of the above listed sea turtle species. No critical habitat has been designated for any of the sea turtles in the continental U.S.; therefore, none would be affected.

The proposed project would directly and indirectly affect approximately 26 acres of sea turtle nesting habitat along approximately 1.1 miles of SRI Gulf of Mexico beachfront. This area accounts for 0.08 percent of the approximately 1,400 miles of available sea turtle nesting habitat in the southeastern U.S. It is estimated that up to 1.51 loggerhead sea turtle nests, 1 adult loggerhead female sea turtle, and 172 loggerhead hatchlings annually; and 0.95 green sea turtle nest, 1 adult green female sea turtle, and 129 green hatchlings may be incidentally taken. No take of leatherback or Kemp's ridley sea turtle nests, adult females, or hatchling sea turtles are anticipated. The loss of sea turtle nests, adult female sea turtles, and hatchling sea turtles will not appreciably reduce the survival and recovery of the loggerhead (1.51 nests out of 50,000 to 90,000 laid annually and up to 172 hatchlings out of 8.4 million annually), and green (0.95 nest out of 500 to 9,000 nests and 129 hatchlings out of 1.2 million biennially) sea turtles in the wild in the Southeast U.S.

INCIDENTAL TAKE STATEMENT

Section 9 of the Endangered Species Act (Act) and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include major habitat modification or degradation that results in death or injury to listed species

by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to noticeably disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and shall be implemented by Eglin for the exemption in section 7(o)(2) to apply. Eglin has a continuing duty to regulate the activity covered by this incidental take statement. If Eglin (1) fails to assume and assure implementation of the terms and conditions or (2) fails to require the project contractors to adhere to the terms and conditions of the incidental take statement through enforceable terms, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, Eglin shall report the progress of the project and its impacts on the species to the Service as specified in the incidental take statement [50 CFR §402.14(I)(3)].

AMOUNT OF EXTENT OF TAKE

The Service has reviewed the biological information and other information relevant to this action. Based on this review, incidental take is anticipated for (1) all sea turtle nests that may be laid and eggs that may be deposited and missed by the day and night nesting surveys along the 1.1 miles of the Action Area; (2) all sea turtle nests deposited during the period when a nest survey program is not required to be in place along the 1.1 miles in the Action Area; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) reduced hatching success or destruction of nests from washout or inundation due to the effects of the armoring structures on shoreline processes; (5) harassment in the form of disturbing or interfering with adult female sea turtles approaching the shoreline, attempting to nest, or returning to the sea after nesting along the 1.1 miles within the Action Area; (6) behavior modification of nesting adult sea turtles due to interactions with storm protection structures along the 1.1 miles in the Action Area, resulting in false crawls or situations where nests are deposited in marginal or unsuitable nesting areas; and (7) entrapment or injury of adult sea turtles or hatchlings from entrapment or interaction with equipment and project material stored on the beach at night during the sea turtle nesting season.

Incidental take is anticipated from the storm protection activities during the 2006 and possibly the 2007 sea turtle nesting seasons from some of the construction related activities and in future sea turtle nesting seasons from the permanent presence of the storm protection structures. The Service anticipates incidental take of sea turtles would be difficult to detect for the following reasons: (1) sea turtles nest primarily at night and all nests are not found because of human error, the construction activities, and natural factors, such as rainfall, wind, and tides may obscure crawls and result in nests being destroyed because they were missed during a nesting survey; (2)

hatchling sea turtles typically emerge from the nest at night and all hatchlings affected may not be found as a result of predation, dessication or being washed away, or (3) an unknown number of adult female sea turtles may avoid the beach where storm protection structures have been installed and be forced to nest in a less than optimal area reducing odds of nest success; and (4) behavior modification of nesting females or hatchlings due to physical presence of the storm protection structures on the beach.

Since some of the activities will take place within the sea turtle nesting season, adverse effects to sea turtles within approximately 26 acres of nesting habitat along 1.1 miles of Gulf of Mexico beachfront can be anticipated. The take could include up to 1.51 loggerhead sea turtle nests, 1 adult loggerhead female sea turtle, and 172 loggerhead hatchlings annually, 0.95 green sea turtle nest, 1 green adult female sea turtle, and 129 green turtle hatchlings biennially. No take of leatherback or Kemp's ridley sea turtle nests, adult female turtles or hatchlings is anticipated.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to loggerhead or green sea turtles. No take of leatherback or Kemp's ridley sea turtles is anticipated, thus, the proposed action is not likely to result in jeopardy to leatherback or Kemp's ridley sea turtles. Critical habitat has not been designated within the 1.1-mile Action Area of the storm protection activities; therefore, the project would not result in destruction or adverse modification of critical habitat for loggerhead, green, leatherback, or Kemp's ridley sea turtles.

Incidental take of nesting and hatchling sea turtles and sea turtle nests is anticipated to occur during the 2006 and possibly during the 2007 nesting seasons from construction activities and for an undetermined number of years from the armoring structures. The take would occur on nesting habitat consisting of approximately 1.1 miles of beachfront. However, measures to reduce potential impacts to nesting females, their nests and eggs, and hatchlings have been incorporated into the activities.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures (RPMs) are necessary and appropriate to minimize take of sea turtles as a result of the storm protection activities along the 1.1 miles Gulf of Mexico beachfront on SRI controlled by Eglin.

The storm protection activities may be conducted during the 2006 and 2007 sea turtle nesting seasons (May 1 through October 31, 2006 and 2007), provided the following reasonable and prudent measures are incorporated into the work plans.

1. All conservation measures proposed by Eglin to avoid or minimize impacts to nesting and hatchling sea turtles shall be implemented.

2. Beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence must be used for any fill or backfill.

3. Eglin shall implement additional sea turtle protection, monitoring, and habitat protection to ensure sea turtle nesting and nest hatching impacts from the activities are minimized.

4. Eglin shall locate the storm protection armoring structures as landward as practicable to the structure it is protecting to minimize permanent impacts to sea turtle nesting habitat.

5. All sea turtle nests laid in the area of the storm protection work shall be relocated.

6. Eglin shall ensure that the terms and conditions are accomplished and completed as detailed in this incidental take statement including completion of reporting requirements.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, Eglin must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

Proposed Work

1. The new and or/repaired storm protection armoring structures or rock toe scour protection at Test Sites A-3, A-11, A-13 and A-13B shall be constructed as close as feasible to the structures they are to protect, but no further than 20 feet seaward of the seaward-most edge of the foundation of the structure.

2. The new bulkhead at Test Site A-3½ shall be located as close as feasible to the new concrete pad.

3. All material used for the seawall backfill must be similar to the native beach sand found on Santa Rosa Island. The fill material must be similar in both coloration and grain size distribution to the native beach. All such fill material must be free of construction debris, rocks, or other foreign matter and must not contain, on average, greater than 10 percent fines (i.e., silt and clay) (passing the #200 sieve) and must not contain, on average, greater than 5 percent coarse gravel or cobbles, exclusive of shell material (retained by the #4 sieve).

4. All non-biotic storm debris such as asphalt or concrete must be removed from the nesting beach and in other areas where a future storm could redistribute the material onto the nesting beach.

5. Upon completion of construction, all construction materials and debris must be removed from the beach. The beach within the work area shall be contoured similar to adjacent beaches outside of the work area.

6. The material used for the access road at Test Site 3½ shall be material compatible with the coastal environment. The material may be Bahama rock, or a material of comparable color and composition.

7. If the repaired or new armoring structures are determined to cause erosion to adjacent sea turtle nesting habitat, appropriate remedial measures shall be undertaken prior to the 2007 or the 2008 sea turtle nesting season as appropriate (May 1, 2007 or 2008). Remedial measures could include but may not be limited to: removal or relocation of the armoring structure.

Species Protection

1. All conservation measures proposed by Eglin to avoid or minimize impacts to nesting and hatchling sea turtles shall be implemented.

2. The storm protection work may be conducted only during the daytime hours and only during the 2006 and 2007 sea turtle nesting seasons (May 1 – October 31, 2006 and 2007).

3. All storm protection work occurring from May 1 through October 31 shall wait until the daily sea turtle nest survey and protection (nest marking and/or relocation) are completed.

4. If sea turtle nests are laid within 500 feet on either side of the storm protection work areas, the eggs shall be relocated per the following requirements.

    a. Nesting surveys and egg relocations shall only be conducted by Eglin Natural Resources or their designee. Nest surveys must be conducted daily between sunrise and 9 a.m. Surveys shall be performed in such a manner so as to ensure that storm protection work does not occur in any location prior to completion of the necessary sea turtle protection measures.

    b. Only those nests that may be affected by storm protection work shall be relocated. Nests requiring relocation shall be moved no later than 9 a.m. the morning following deposition and as close as feasible to the original nest site and outside the impact of the storm protection work. Nest relocations in association with storm protection work shall cease when work activities no longer threaten nests. Any nests left in the active work zone must be clearly marked, and all mechanical equipment shall avoid nests by at least 10 feet.

c. All relocated sea turtle nests shall be marked. The nest marking may be in the form of a predator-proof cage or other marking in accordance with Eglin's FWC permit and guidelines and conspicuous to military personnel or their contractors.

d. Relocated nest sites shall be inspected daily to assure nest markers remain in place and the nest has not been disturbed.

5. All equipment or vehicles shall be removed from the beachfront nightly during the sea turtle nesting season (May 1 through October 31). Stockpiled armoring material or debris that cannot be feasibly removed from the beach shall have a barrier erected around them to prevent the movement of adult or hatchling sea turtles underneath or into the armoring material or debris and becoming entrapped, misoriented, or disoriented. The barrier must be composed of a material, and be at a height, and installed so that adult turtles cannot knock down or crawl over the barrier, and hatchlings cannot crawl beneath it.

Species Monitoring

1. Daily early morning surveys shall be required if any portion of the storm protection work occurs during the period from May 1 through October 31 in accordance with established State of Florida Index Nesting Beach Survey (INBS) and Eglin Natural Resources protocol. The frequency of hatching and emerging success monitoring after September 1 shall involve checking nests daily until the last nest has either hatched or reached 80 days incubation, at which time the nest will be evaluated per state protocol. Hatching and emerging success monitoring shall involve checking nests beyond the completion date of the daily early morning nesting surveys.

2. Nesting surveys shall only be conducted by Eglin Natural Resources staff or their designee. Nest surveys must be conducted daily between sunrise and 9 a.m. Data gathered during the survey shall be in the form required by the FWC permit. The survey shall include geographic position data collection and the data shall be incorporated into Eglin's geographic information system.

   a. Nests deposited within areas where storm protection work have ceased or will not occur for 80 days must be marked and left *in situ* unless other factors threaten the success of the nest.

   b. All sea turtle nests shall be marked. The nest marking may be in the form of a predator-proof cage or other marking in accordance with Eglin's FWC permit and guidelines and conspicuous to military personnel or their contractors. Once a nest is marked or it is determined that there is no nest and it is a false crawl, the crawl shall be obliterated so that it is obvious that the site has been checked.

c. Nest sites shall be inspected daily to assure nest markers remain in place and the nest has not been disturbed. Eglin NRS shall document all interactions between sea turtles and storm protection structures including photographs.

3. Eglin shall continue to participate in the State of Florida's Sea Turtle Stranding and Salvage Network. All strandings shall include geographic position data collection and the data shall be incorporated into Eglin's geographic information system.

Habitat Protection, Impact Evaluation, and Restoration and Maintenance

1. Eglin shall ensure that beach and dune habitats impacted by the storm protection work are appropriately restored and maintained with concurrence from the Fish and Wildlife Service.

2. All ruts resulting from the storm protection work deeper than 3 inches shall be removed prior to sunset at nests that are at incubation day 60 or greater during the 2006 and 2007 sea turtle nesting seasons.

Reporting

1. Eglin Natural Resources personnel shall be immediately notified upon location of a sea turtle adult, hatchling, or egg that had been harmed or destroyed. Eglin Natural Resources, their designee, or the 24-hour contact shall be responsible for notifying the Florida Fish and Wildlife Conservation Commission Sea Turtle Stranding and Salvage Network by Pager: 1-800-241-4653, ID#274-4867; and the U.S. Fish and Wildlife Service Office located in Panama City, Florida at (850) 769-0552. Care should be taken in handling injured turtles or eggs to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials in the best possible state for later analysis.

2. A report describing the actions taken to implement the terms and conditions of this incidental take statement must be submitted to the Project Leader, U.S. Fish and Wildlife Service, 1601 Balboa Avenue, Panama City, Florida, 32405, within 60 days of the end of the 2006 and 2007 calendar years or the completion of the project. This report shall include the dates of the activities, assessment and action taken to address impacts to sea turtle and their habitats on Santa Rosa Island if they occurred, and hatching and emerging success of nests. If no activities take place, a negative report is still required, with sea turtle nesting survey data for the year. Only if all the activities are cancelled will the above conditions not be required.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Endangered Species Act (Act) directs federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. Eglin should complete all the storm protection activities prior to the 2007 sea turtle nesting season to further minimize impacts to sea turtle nesting.

2. Eglin should delete rip rap to be placed at Test Sites A-3 and A-13. Relocating the structures landward would alleviate the need for toe scour protection.

3. Eglin should finalize a plan to replace the vulnerable military facilities on SRI with structures/facilities that are built to coastal construction standards. This would alleviate the need to armor the structures.

4. Eglin should finalize a plan to address dune restoration and protection needs caused by the hurricanes and other storm events of 2004 and 2005. This plan should ensure maintaining the ecological integrity of the barrier island.

5. Eglin should continue to work with the Florida Department of Transportation to ensure that reconstruction and repair of U.S. Highway 98 does not cause additional impacts to dune habitat.

REINITIATION/CLOSING NOTICE

This concludes formal consultation on the action outlined in this biological opinion. As provided in 50 CFR 402.16, reinitation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take shall cease pending reinitation.

The above findings and recommendations constitute the report of the Department of the Interior. This concludes formal consultation on the SRI Storm Protection activities at Eglin Air Force Base. If you have any questions about this opinion, please contact Lorna Patrick of this office at extension 229.

Sincerely yours,

Lorna Patrick
Acting Field Supervisor

cc:
Sandy MacPherson, FWS, Jacksonville, FL
Robbin Trindell, FWC, Tallahassee, FL
John Himes, FWC, Panama City, FL
Joe Johnston, FWS, Atlanta, GA (electronic copy)

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APPENDIX H

PUBLIC REVIEW PROCESS

PUBLIC REVIEW PROCESS

The public review process provides an opportunity for members of the public to comment on federal actions addressed in NEPA documents. A public notice was placed in the Northwest Florida Daily News announcing the availability at area libraries of copies of the Draft Environmental Assessment for Immediate Storm Surge Protection for Santa Rosa Island Facilities, Eglin Air Force Base. The public review period was 30 days. The notice ran in the Northwest Florida Daily News 2 March and 5 March 2006. A copy of each ad as it ran in the newspaper is shown below (Figures H-1 and H-2). There were no public comments.

Page B4 | Daily News | **Thursday, March 2, 2006**

Notice of Availability of Draft Environmental Assessment

In compliance with the National Environmental Policy Act, Eglin Air Force Base (AFB) announces the availability of the draft Environmental Assessment (EA), draft Finding of No Significant Impact (FONSI), and draft Finding of No Practicable Alternative (FONPA) for Immediate Storm Surge Protection for Santa Rosa Island Facilities, Eglin Air Force Base (AFB), Florida.

The Proposed Action is to initiate immediate and temporary severe storm event (i.e., tropical storms, hurricanes) protection to mission-critical test facilities at Santa Rosa Island Range Complex at Eglin AFB, Florida. The Air Force would: 1) repair, extend and replace existing seawalls and 2) construct new seawalls and bulkheads. The Air Force would implement the Proposed Action prior to the 2006 hurricane season.

Copies of the draft EA, draft FONSI, and draft FONPA are now available for public review and comment at the following public libraries:

Niceville Public Library, located at 206 N. Partin Dr., Niceville, FL 32578.
Library hours are T, Th. 9am-8pm; W, F 9am-6pm; and Sat 9am-2pm.

Fort Walton Beach Public Library, located at 185 Miracle Strip Pkwy, SE, Ft. Walton Beach, FL 32548. Library hours are M, Th. 9am-9pm; and F, Sat 9am-5pm.

Destin Library, located at 150 Sibert Avenue, Destin, FL 32541. Library hours are M, F 9am – 5pm; T, 9am – 8pm; W 1pm – 5pm; Sat 9am – 5pm.

The public is invited to provide written comments on issues or concerns they may have with the proposed action. Comments for consideration should be provided in writing to: Eglin Air Force Base, Attention: Mr. Mike Spaits, 96 CEG/PAV, 501 Deleon St. Ste.101, Eglin Air Force Base, Florida 32542. Or e-mail, mike.spaits@eglin.af.mil. The document will have a 30-day comment period and will end March 31, 2006. Comments must be received by April 4, 2006 to be considered.

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Figure H-1. 2 March Notice of Availability

Sunday, March 5, 2006 | Daily News | **Page B7**

Notice of Availability of Draft Environmental Assessment

In compliance with the National Environmental Policy Act, Eglin Air Force Base (AFB) announces the availability of the draft Environmental Assessment (EA), draft Finding of No Significant Impact (FONSI), and draft Finding of No Practicable Alternative (FONPA) for Immediate Storm Surge Protection for Santa Rosa Island Facilities, Eglin Air Force Base (AFB), Florida.

The Proposed Action is to initiate immediate and temporary severe storm event (i.e., tropical storms, hurricanes) protection to mission-critical test facilities at Santa Rosa Island Range Complex at Eglin AFB, Florida. The Air Force would: 1) repair, extend and replace existing seawalls and 2) construct new seawalls and bulkheads. The Air Force would implement the Proposed Action prior to the 2006 hurricane season.

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Figure H-2. 5 March Notice of Availability